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ABSTRACT

This report discusses the third year effort of a federally funded program to study the development and implementation of a variety of cooperative arrangements between junior colleges and senior institutions regarding industrial teacher preparation. Three major activities were completed in the first two years of the program: (1) the study of present technical offerings in junior colleges in six selected states; (2) a survey of problems of articulation between junior colleges and senior institutions; and (3) a review of all research relating to technical programs in junior colleges and industrial teacher preparation programs. The principal aims of the third year were: (1) survey 29 additional states not previously covered to determine guideline bulletin value for giving industrial teacher education programs direction; (2) establish four to six pilot centers in which guideline recommendations would be implemented; (3) develop a junior college counselor handbook; (4) develop a model industrial education transfer guide for junior college students; (5) publicize a guideline bulletin titled, "Partners in Industrial Technical Teacher Education;" and (6) stimulate interest in developing occupational education master plans. Included as appendices are copies of the "Handbook" and "Guide." (AL)

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Final Report

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# DEVELOPMENT OF JUNIOR/COMMUNITY COLLEGE CURRICULA FOR FUTURE TEACHERS OF INDUSTRIAL EDUCATION

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## SECTION I
## INTRODUCTION

Programs of industrial teacher preparation in the years ahead cannot be the sole responsibility of senior institutions. The growth of the technical programs in the community/junior colleges and the increase in transfer students make it imperative that cooperative teacher education be developed. It is evident that the only way the future supply of industrial education teachers can be assured is to plan an articulated program in which the staff, facilities, and counseling services of the community/junior college could be utilized in helping to prepare these teachers. In other words, it is necessary to develop and implement a variety of cooperative arrangements with the community/junior colleges and senior institutions. A Federal grant was obtained to study this problem. The major activities of the first two years were:

A. To study the present technical offerings in the community/junior colleges in the six states of California, Florida, Illinois, Michigan, New York, and Texas and to correlate these offerings with the requirements for a degree in industrial education in the senior institutions.

B. To survey the problems of articulation between the community/junior colleges and senior institutions in the six states including areas of curriculum, counseling, staff, and facilities. This was accomplished by sending surveys to industrial education department heads, admission offices, and transfer students in industrial education in senior institutions; and to counselors and deans of technical studies at community/junior colleges.

C. To review all research relating to technical programs in the community/junior colleges and industrial teacher preparation programs in senior institutions to provide a background on each of the subjects including curriculum, counseling, staff, facilities, and the future of the community/junior colleges.

Based upon these statistical studies, a work/study conference of representatives from the six states gathered in May of 1969 on the Campus of Western Michigan University to develop a guideline bulletin that would improve the quality and quantity of industrial education teachers in these states.

These leaders recommended two innovative approaches for preparing industrial education teachers. These methods are identified as the PAP (Partnership and Pyramid) Programs. The Partnership Program (two and two) is a planned curriculum developed cooperatively by the community/junior college and the senior institution with a structured pre-industrial teacher program at the community/junior college. It is designed as another career opportunity for students wishing to take vocational/industrial and technical classes. This two-year curriculum should be accepted at the senior institution as the first two years of a degree program in industrial education. It is designed for students who decide to become industrial education teachers before entering the community/junior college.

The Pyramid Program (two plus two) is a plan for building a four-year industrial education degree on the A.A.S. in technology. The senior institution would tailor a program for the technical graduate building on his technical competencies such additional courses in mathematics, science, education, and general academic as are needed to prepare him for teaching in the vocational/industrial and technical education. It is designed for students who decide to become teachers of industrial education later in their community/junior college experience or before they enter the senior institution. A graphic, 64-page guideline bulletin, which is printed in several colors, was mailed to counselors and deans of technical studies in the community/junior colleges; admission offices, heads of industrial education departments in senior institutions; and selected professional personnel in state departments who may have an influence on teacher preparation in the coming years.

## The Problem

Once the model for preparing teachers had been established, it was evident that it was necessary to implement this model and to put it into practice through a variety of action programs.

A one-year extension was granted that focused on people and programs. Articulation is no accident; it exists only where community/junior colleges and senior institutions know their needs and capacities for preparing industrial education teachers and take an active part in translating these known needs into action programs. Obviously, nothing worthwhile will happen in the development of an articulation program unless the people involved want it to happen. Articulation will be only as good as the support and cooperation that can be obtained.

## The Objectives

The principal aims of the third year of this study were as follows:

A. To survey the 29 additional states not previously covered by this study to determine the value of the guideline bulletin for giving direction to their industrial teacher education programs in the years to come. These states were selected because the state directors of vocational education indicated an interest in the project and a willingness to cooperate. The original guideline bulletin and a survey form were sent to deans of technical studies and counseling directors in the community/junior colleges; and the department heads in the senior institutions.

B. To establish four to six pilot centers in which the guideline recommendations would be implemented in the senior institutions. The pilot centers chosen were:

   1. California State College at Long Beach -- This institution is typical of a large teacher preparation center in which the overwhelming majority of students are transfers from the community/junior colleges. Over 95 percent of the students enrolled in industrial education at this college are transfers from the community/junior colleges in California.

2. Florida Atlantic University with community/ junior colleges in Broward, Dade, and Palm Beach Counties -- This institution is an upper undergraduate school only. All of the students are transfers from the community/ junior colleges. Florida Atlantic University did not have and does not presently have an industrial teacher education program but is anxious to utilize the findings of this research project in developing their program.

3. Illinois State University -- This school is typical of the teacher preparation centers in Illinois that are in the throes of establishing successful articulation programs with the community/junior colleges. The community/ junior college movement in Illinois is relatively new and the articulation problems are generally in a state of flux.

4. Wayne State University in metropolitan Detroit -- Representative of schools that have educational programs without physical plants, this institution has now become involved in a coordinated approach in occupational education. The individual departments of industrial education, home economics, etc., have been discontinued and an over-all structure of occupational teacher education has been developed. This type of school is restricted in the kinds of industrial education teachers who can be prepared to those receiving all the technical preparation in the community/ junior colleges. Only professional general education related to mathematics and science is offered on the University's campus.

5. Western Michigan University and eight community/junior colleges in Southwestern Michigan -- This senior institution has an extensive facility which is typical of about 10 percent of the largest institutions training industrial education teachers.

C. To develop a counselor's handbook for community/junior college personnel. This bulletin has been designed for use by counselors in all community/junior colleges in the United States.

D. To develop a model industrial education transfer handbook for community/junior college students. This model has been developed for specific use by Western Michigan University and the eight community/junior colleges in its immediate geographic area.

E. To publicize the guideline bulletin titled "Partners in Industrial Technical Teacher Education/The cooperative Roles of the Community-Junior Colleges and the Senior Institutions" through presentations at professional meetings.

F. To stimulate an interest in developing master plans for occupational education that involve community/junior colleges and the vocational/technical centers.

## Scope and Method

A. The first objective was achieved by surveying the state directors of vocational education to determine which states were interested in this research project. Based on this information, the guideline bulletin and a survey form were sent to deans of technical studies, heads of counseling in community/junior colleges; and the heads of industrial education departments in senior institutions. Follow-up surveys were sent as necessary.

B. The second objective was carried out by personal contacts and activities with professional personnel in each of the pilot centers. A complete report of these activities is outlined in Section IV of this report.

C. The "Handbook for Counselors" was developed through activities of a work/study conference. Deans of technical studies and counseling directors from community/junior colleges met on the campus of Western Michigan University to develop guides for this publication. Preliminary material was prepared at this meeting.

D. "A Guide for the Transfer Student" was also developed during the aforementioned work/study conference. Additional help was secured from guidance counselors in community/junior colleges and some deans of admissions through a survey which indicated what kinds of information transfer students needed.

E. This project was publicized through presentations at several professional meetings. One of the Co-Directors became involved with all the teacher education institutions in Illinois and Indiana to present the problems, objectives, and proposed solutions suggested by this project. This Co-Director also served as a resource director in and for a series of conferences that were held on articulating the community/junior college programs in Illinois with the senior institutions.

The Co-Directors have prepared an article for publication in a national journal.

F. Consultant services for two states desiring to develop master plans for occupational education have been provided actively during the last six months. The directors have been in contact with Dr. Lloyd Briggs of the EPDA in Washington and have worked actively with Mr. William Lewis of the USOE Region V Office. The six states in Region V are currently evaluating the possibility of developing additional research that will aid in establishing their master plans for occupational teacher education.

## SECTION II
## EVALUATION OF "PARTNERS" BULLETIN

The guideline bulletin "Partners in Industrial-Technical Teacher Education/The Cooperative Roles of the Community-Junior Colleges and the Senior Institutions" was based primarily on an exhaustive and intensive study of the articulation problems in the six states of California, Florida, Illinois, Michigan, New York, and Texas. As a part of the follow-up study, it was decided to determine how useful this bulletin might be to the other 44 states that are in various stages of developing their community/junior college systems.

The state vocational education directors were surveyed to determine their degree of interest in this project. Twenty-nine of these directors indicated they were interested in and concerned with the problems of preparing industrial/technical teachers and utilizing the resources of the community/junior colleges in their states. These 29 states were then additionally surveyed to ascertain the number of community/junior colleges as well as the number of senior instiutions offering programs of industrial teacher preparation. Copies of the bulletin and the survey form were sent to three basic groups of interested personnel:

A. Counselors in community/junior colleges who might be working with students wishing transfer to a senior institution for industrial teacher preparation.

B. Deans of technical studies in community/junior colleges who have administrative responsibility for vocational/technical programs.

C. Department heads in senior institutions with accountability for industrial education programs.

It is significant to note the responses of these three different groups of individuals. For ease of evaluation, the responses have been arranged in tabular form so the reader can compare the reactions of the counselors and technical deans

with those of the department heads to each of the questions. In each of the responses, the percentage of those individuals not answering is indicated by NA.

A. Teacher Shortages in Industrial Education

It is apparent that all groups agreed there are greater teacher shortages in vocational/ industrial and technical education than indus- arts. While department heads, who are closest to the problem, felt there was a shortage of industrial arts teachers, almost half of the technical deans felt there was no shortage. These figures do not define in detail the kinds of openings that might be available. From previous research, it has been determined that certain areas of industrial arts, particularly those in power, electricity/electronics, plastics, and graphic arts, have severe shortages while the number of drafting teachers is in good balance.

*Do you believe there is a shortage of teachers in the following subject areas in your state?*

| | | Ind. Arts | | | Voc/Ind. | | | Tech. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | NA | Yes | No | NA | Yes | No | NA |
| C/JC | Counselors | 45 | 41 | 14 | 75 | 17 | 8 | 82 | 11 | 7 |
| | Tech. Deans | 32 | 48 | 20 | 71 | 18 | 11 | 82 | 14 | 4 |
| SI | Dept. Heads | 79 | 21 | 0 | 79 | 16 | 5 | 80 | 13 | 7 |

SI = Senior Institution Industrial Education Department Heads
C-JC = Community/Junior College Counselors

B. Acquaintance with State Master Plan for Occupational Education

As might be expected, deans of technical studies and department heads are generally familiar with the master plans for preparing occupational teachers, although a fourth of both of these groups were not. Some states have been slower than others in developing their master plans and this may be a reason for the groups not being acquainted with them. Counselors in community/junior colleges are not as likely to be interested in the state plans. However, it is critical that certain counselors in the community/junior college understand the implications of the master plan in career planning.

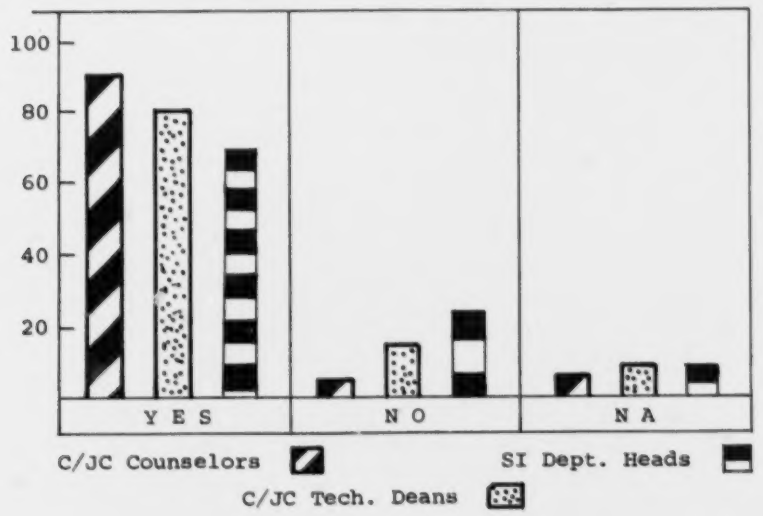
*Are you acquainted with the master plan for preparing occupational teachers in your state?*

| | Y E S | N O | N A |
|---|---|---|---|
| Counselor (C/JC) | 36 | 58 | 6 |
| Tech. Dean (C/JC) | 68 | 25 | 7 |
| Department Head (SI) | 68 | 25 | 7 |

C. Professional and Technical Courses in the Community/Junior College

There is general accord among the counselors, technical deans, and department heads that the community/junior college should play a role in offering technical and professional courses for students planning to become industrial education teachers. It is interesting to note, however, that about a fourth of the department heads in the senior institutions do not approve of the community/junior college as a teacher preparation center for either technical or professional courses. A survey among department heads in the original study revealed there are certain department heads, particularly those in programs limited to industrial arts teacher preparation, who do not feel that the courses offered in the community/junior colleges are of equal quality or suitable to the same type of courses offered in their departments. In other words, some department heads consider community/junior college professional and technical offerings as being second-class education.

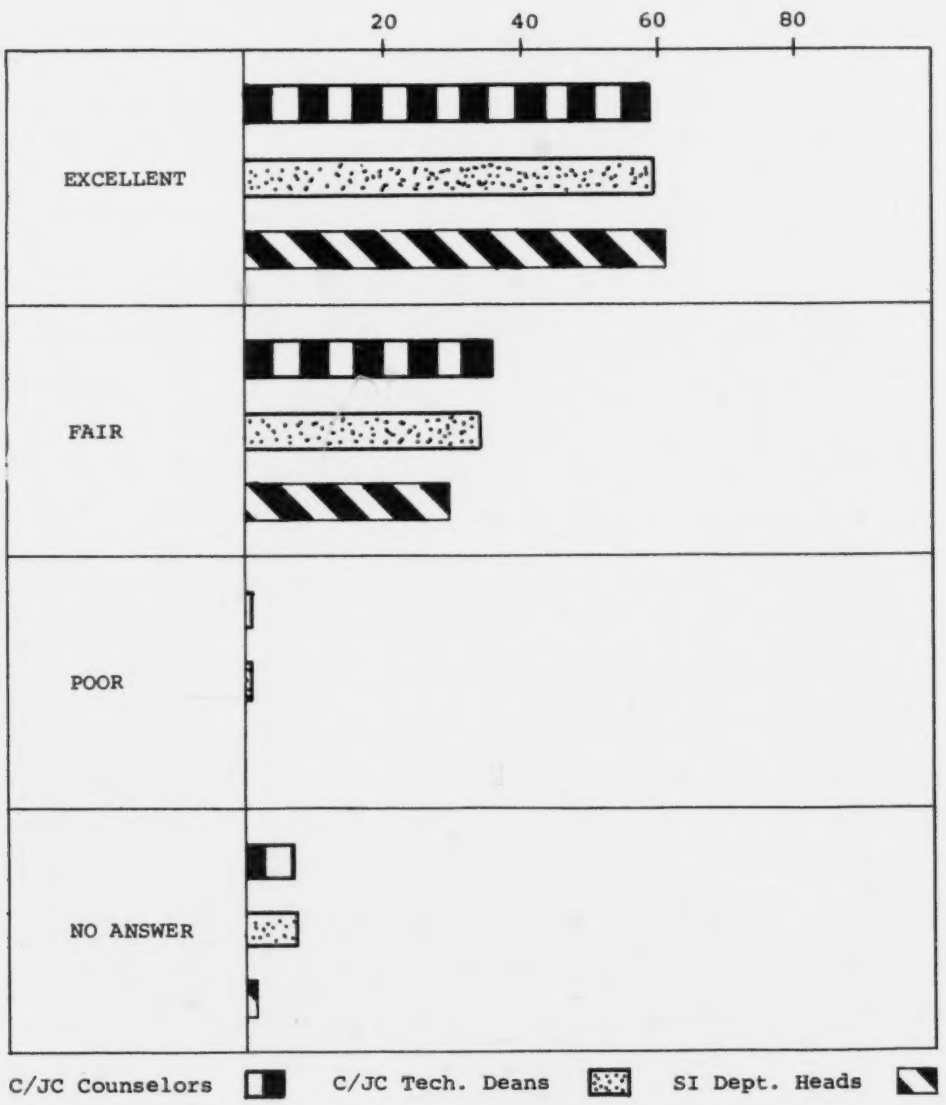
*Do you believe that the C-JC should provide technical and professional courses for students planning to complete a teaching degree at an SI?*



D. Reaction to the Bulletin

Almost sixty percent of all three groups believe that the bulletin provided an excellent guide to problems related to industrial/technical teacher preparation. Another 32 percent rated the bulletin fair, and only one percent of the professional personnel in the community/junior colleges (none of the department heads) considered the bulletin poorly done and of little value.

*What is your over-all reaction to the bulletin in terms of accuracy, comprehension, presentation, and utility?*



E. Usefulness of Specific Parts of the Bulletin

The bulletin contains six main sections as shown in this table. The section on "Focus on the Problem" received the largest percentage of excellent responses, while the section "Counseling and Guidance" was the lowest rated section. Interestingly enough, the department heads rated the section on "Counseling and Guidance" lower than did the counselors in the community/junior colleges. A very small minority of those responding felt that the bulletin was poor. In general, the over-all rating was fair to excellent in all categories.

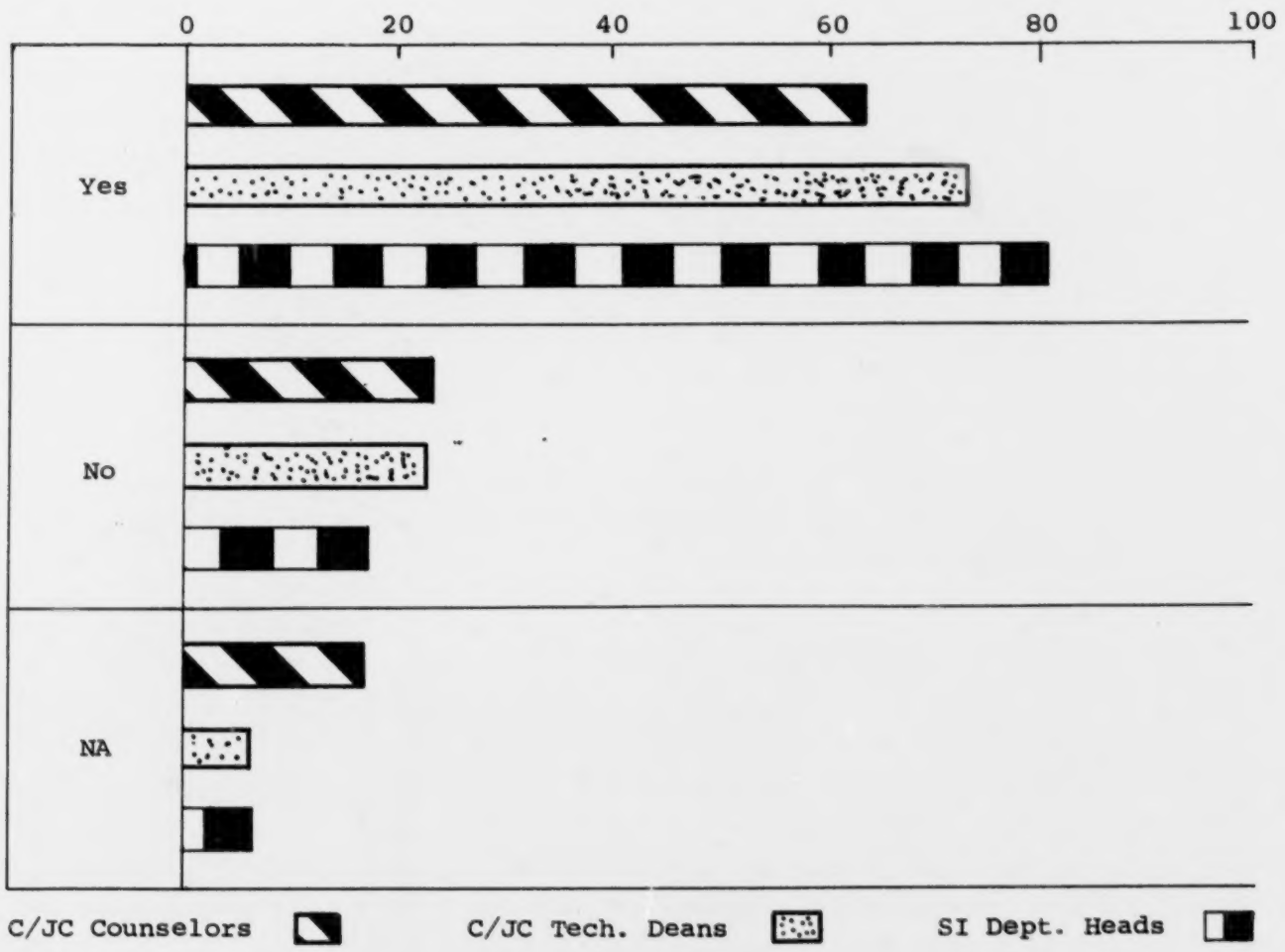
*How do you evaluate the usefulness of the information and recommendations dealing with:*

| | Focus on the Problem | | | Curriculum | | | Articulation | | | Staff & Facilities | | | Counseling & Guidance | | | Student Transfers & Admissions | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | TD | DH | C | TD | DH | C | TD | DH | C | TD | DH | C | TD | DH | C | TD | DH |
| Exc. | 57 | 62 | 64 | 49 | 45 | 46 | 41 | 40 | 55 | 46 | 47 | 55 | 43 | 42 | 39 | 45 | 42 | 50 |
| Fair | 31 | 31 | 28 | 36 | 43 | 49 | 40 | 49 | 34 | 40 | 40 | 37 | 43 | 43 | 51 | 36 | 43 | 43 |
| Poor | 2 | 1 | 3 | 0 | 1 | 1 | 3 | 3 | 4 | 2 | 2 | 1 | 5 | 4 | 1 | 4 | 2 | 1 |
| NA | 10 | 6 | 5 | 15 | 11 | 4 | 16 | 8 | 7 | 12 | 11 | 7 | 9 | 11 | 9 | 15 | 13 | 6 |

F. Student Transfer and Admission Problems

The "Partners" bulletin listed a series of major problems experienced by students transferring to senior institutions. The primary problems listed were loss of transfer credit, financial, and the requirement to take additional basic courses. All three groups of personnel agreed these were the major problems and plans must be made to correct the sources of these problems immediately.

*Do the problems outlined in the section "Student Transfer and Admission" reflect those you are currently having with transfer students?*



G. Status of Partnership and Pyramid Programs

In view of the large percentage of personnel not answering this particular question, it is obvious that not as much progress has been made in developing programs of cooperative teacher preparation as might be desired. While the Pyramid Program is simpler to implement, this study indicates that, on an average, less than 20 percent have such a program and only slightly more than 20 percent indicated they are planning one. Obviously, the department heads in the senior institutions can control this program since it is one in which the degree is built on the first two years of an A.A.S. secured from the community/junior college. When the department head group is considered separately, approximately one-third (33 percent) indicated they are planning to establish such a program. The Partnership Program requires a great deal of cooperative planning between the community/junior colleges and the senior institutions in order to implement it. Here, again, 20 percent indicate they have a program and approximately 26 percent indicate they are planning to establish one. It is hoped the "Partners" bulletin, plus the bulletins developed in the third year of this study, will provide the spark for developments in this direction.

*Do you presently have or are you planning an arrangement between the C-JC and SI in your geographic area that follows the general guidelines listed under the:*

| | PARTNERSHIP | | | | | | PYRAMID | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Have | | | Planning | | | Have | | | Planning | | |
| | Yes | No | NA | Yes | No | NA | Yes | No | NA | Yes | No | NA |
| Counselor (C/JC) | 14 | 51 | 35 | 17 | 49 | 34 | 21 | 45 | 34 | 4 | 48 | 48 |
| Tech. Dean (C/JC) | 20 | 45 | 35 | 28 | 47 | 25 | 15 | 43 | 42 | 25 | 43 | 32 |
| Dept. Head (SI) | 26 | 38 | 36 | 34 | 36 | 30 | 16 | 46 | 38 | 33 | 36 | 31 |

H. Articulation Meetings

One of the most common criticisms of profes-ional personnel in the community/junior colleges and senior institutions is that they do not have opportunities to interact on the problems re-lating to articulation. On balance, there appears to be equal division between approximately half who say meetings are being held and another half who indicate meetings are not being held.

*Are meetings held between personnel of the SI and C-JC in your area to discuss the articulation of programs for preparing IE teachers?*

| | Y E S | N O | N A |
|---|---|---|---|
| Counselor (C/JC) | 41 | 54 | 5 |
| Tech. Dean (C/JC) | 48 | 43 | 9 |
| Dept. Head (SI) | 54 | 46 | 0 |

I. New Ideas

To be successful, the Partnership Program should involve several types of professional activities. The community/junior colleges need to develop new professional courses for those entering teaching. Both the counselors and technical deans are overwhelmingly in favor of this while the department heads are not quite as sure this is the direction the community/ junior colleges should go. There is widespread agreement among the three groups that there is a need for seminars and in-service programs for the personnel from the community/junior college and the senior institution. However, while there is general agreement that these are desirable goals, there is little evidence that either of these are being developed in the various states. The method of financing these two types of institutions currently is a deterent to any kind of cooperative action in the area of seminars and in-service programs.

*If a Partnership Program were established in your area, should there be:*

| | New Pro. Courses at C/JC | | | Seminars for C/JC & SI Counselors | | | In-service Programs for C/JC & SI Tech. Teachers | | |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | NA | Yes | No | NA | Yes | No | NA |
| C/JC Counselors | 84 | 7 | 9 | 91 | 2 | 7 | 88 | 4 | 8 |
| C/JC Tech. Deans | 74 | 21 | 5 | 90 | 5 | 5 | 94 | 3 | 3 |
| SI Department Heads | 66 | 29 | 5 | 89 | 4 | 7 | 91 | 7 | 2 |

J. Reasons for Not Utilizing the Partnership and Pyramid Programs

In the area of finances, roughly one-third of all the professional personnel indicated that this is the major reason for not starting either the Partnership or Pyramid Program. A smaller portion, approximately 20-25 percent, indicated the major problems were political. In the area of cooperation between the community/junior college and the senior institution, it would appear the personnel from the community/junior colleges feel the senior institutions are not as cooperative as they should be; whereas, department heads feel the community/junior colleges are at fault. However, due to the large number of respondents who did not answer this question, this seems to be a delicate issue. Only a small portion of individuals indicated they now have successful programs.

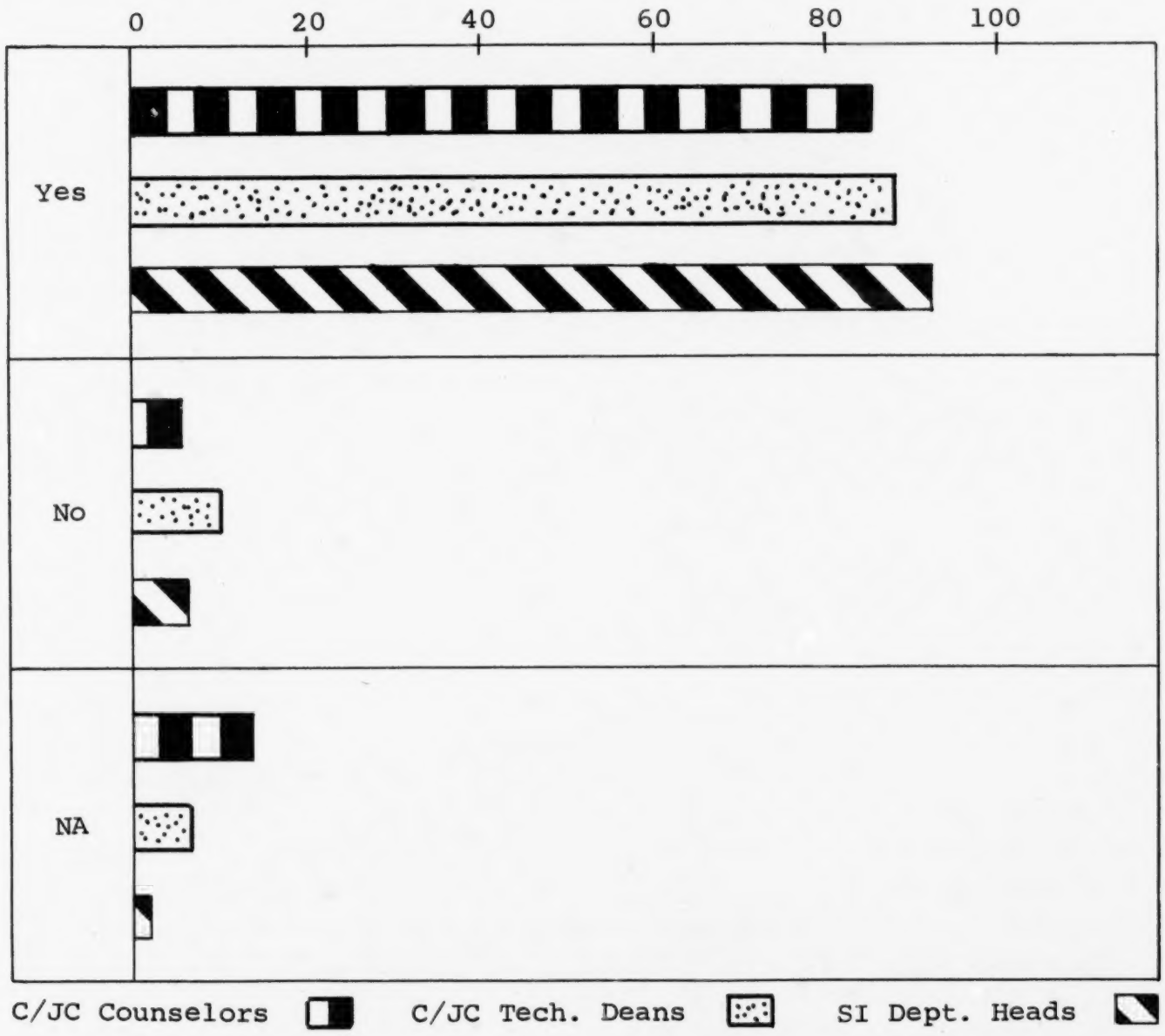
*What reasons can you give for not putting one of the articulation plans into effect immediately?*

| | FINANCIAL PROBLEMS | | | POLITICAL PROBLEMS | | | LACK OF COOPERATION WITH C/JC | | | LACK OF COOPERATION WITH SI | | | HAVE SUCCESSFUL PROGRAM NOW | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pt | Py | NA | Pt | Py | NA | Pt | Py | NA | Pt | Py | NA | Pt | Py | NA |
| C/JC Counselor | 35 | 24 | 41 | 21 | 19 | 60 | 6 | 6 | 88 | 23 | 19 | 58 | 3 | 7 | 90 |
| C/JC Technical Dean | 37 | 29 | 34 | 20 | 20 | 60 | 5 | 4 | 91 | 24 | 17 | 59 | 13 | 8 | 79 |
| SI Department Head | 41 | 30 | 29 | 25 | 28 | 44 | 16 | 12 | 72 | 13 | 7 | 80 | 21 | 14 | 65 |

K. Articulation Improvement Resulting from the "Partners" Bulletin

A majority of the respondents feel that, if the guideline bulletin recommendations are implemented, many of the problems existing between the community/junior colleges and the senior institutions in terms of teacher preparation can be overcome. All too often, however, action does not follow recommendations.

*Do you believe the implementation of the guideline bulletin recommendations will improve the articulation between the C-JC and SI?*



L. The Future of the Partnership and Pyramid Programs

It appears this study will provide a significant influence upon promotion of the Pyramid and Partnership Programs. The real key to the value of this research will be whether or not these programs are, in truth, implemented.

***Will this guideline bulletin affect your future plans for cooperating in IE teacher preparation programs?***

| | YES | NO | NA |
|---|---|---|---|
| Counselor (C/JC) | 57 | 24 | 19 |
| Technical Dean (C/JC) | 64 | 26 | 10 |
| Department Head (SI) | 78 | 14 | 8 |

## SECTION III
## HANDBOOK FOR COUNSELORS
## AND
## A GUIDE FOR THE TRANSFER STUDENT

A most significant portion of the project involved the development of two handbooks to be used by community/junior college personnel and students. Specifically, the handbooks are aimed at improving articulation between the senior institutions and the community/junior colleges in the area of industrial teacher preparation. The "Handbook for Counselors" is designed especially for community/junior college counselors, and the material is general in nature so that any college in the United States can use it. The "Guide for the Transfer Student" is designed for particular utilization by students wishing to transfer to industrial teacher preparation at Western Michigan University. However, this bulletin also serves as a model for other senior institutions to use in developing handbooks of their own.

### A. Development of the Handbooks

1. Basic outlines were based upon a thorough review of the bulletin "Partners in Industrial-Technical Teacher Education/The Cooperative Roles of the Community/Junior Colleges and the Senior Institutions" since this material reflected criticisms, suggestions and recommendations made by students, counselors, and technical deans relative to articulation of the transfer process. Problem areas are also well defined in this bulletin. Special care was taken to prevent any unnecessary overlapping or duplication in the two handbooks.

2. A careful evaluation of each basic outline was made in a series of staff conferences. Upon completion of this, a larger conference was held that involved representatives from the community/junior colleges in the southwestern Michigan area. Counseling staff members and technical deans were present at the conference and contributed their experience and expertise. A considerable amount of time was given to work/study group sessions as well as total conference work/study sessions.

3. The ammended outlines and work materials resulting from the conference were further refined by the project Co-Directors. Detailed material was then developed including charts, graphs, and illustrative information.

4. Tentative copies of the handbooks were distributed to the conference participants for their evaluation.

5. An extensive period of rewriting and reorganization of the documents followed. The handbooks were then finally reviewed by selected conference participants and personnel from states other than Michigan. The resulting handbooks are included in the Appendix.

B. Evaluation of the Handbooks

To determine the usefulness and effectiveness of the handbooks, copies of each was sent to every community/ junior college counselor and head of industrial education department (senior institution) in the six states originally involved in the project. This mailing served two purposes; namely, it acquainted professional personnel in these six states with the two publications, and it also provided a method of evaluation.

The reactions of each of these two groups are listed below in percentages and comparative form. For example, to the question"What is your over-all reaction to the (Coun.) handbook?"; 67 percent of the department heads and 46 percent of the counselors indicated it was excellent. Note that only five percent of the counselors in the community/ junior colleges rated the the bulletin average or below average.

A review of the other items listed in the evaluation form indicates a close agreement between counselors and the teacher educators on almost every issue.

It would appear that these handbooks will serve a much needed purpose in acquainting counselors with the opportunities in industrial education, and giving

heads of departments an opportunity to articulate their present programs with those of the community/ junior college. It must be noted that the "Handbook for Counselors" is designed for use in all states and contains information of value to any counselor in a community/junior college. "A Guide for the Transfer Student" is a model designed specifically for Western Michigan University and the eight community/junior colleges in its immediate geographic area. The Co-Directors believe that this is the only way in which a realistic model could be established to be utilized by other insititutions in various parts of the country. Much of the material in this bulletin can be used by other teacher preparation centers, providing certain specific data is changed to fit a particular situation. Personnel from community/junior colleges and senior institutions generally agreed that both of the handbooks are valuable instruments.

Question three in both evaluation forms seems to indicate there is a need for other kinds of information to be included in the handbooks; namely, (Coun.) information about scholarships and (Student) names of counselors in both community/junior and senior institutions.

HANDBOOK FOR COUNSELORS

1. What is your over-all reaction to the handbook?

| | Exc. | Good | Avg. | Below Avg. | Poor |
|---|---|---|---|---|---|
| *SI | 67 | 33 | 0 | 0 | 0 |
| *CJC | 46 | 49 | 4 | 1 | 0 |

2. Does the bulletin help you to better understand the term <u>industrial education</u>?

| | Yes | No |
|---|---|---|
| SI | 88 | 12 |
| CJC | 97 | 3 |

3. Check those additional items of information which you feel should be included in this handbook:

| CJC | SI | |
|---|---|---|
| 44 | 46 | Scholarship Information |
| 38 | 42 | Dept. Counseling Procedures |
| 18 | 12 | Other |

4. Does the handbook include material which you feel is unnecessary, such as:

| CJC | SI | |
|---|---|---|
| 18 | 10 | Definitions |
| 12 | 10 | Supply/Demand Information |
| 12 | 0 | Curriculum Information |
| 37 | 40 | Occupational Outlook in Brief |
| 12 | 10 | Counseling Information |
| 9 | 30 | Other |

5. Do you feel that a yearly counselors' conference would help in maintaining a close liaison between community/ junior colleges and senior institutions?

| | Yes | No |
|---|---|---|
| SI | 97 | 3 |
| CJC | 95 | 5 |

*SI = Senior Institution Department Heads of Ind. Education
*CJC = Community/Junior College Counselors

A GUIDE FOR THE TRANSFER STUDENT

1. What is your over-all reaction to the handbook?

| | Exc. | Good | Avg. | Below Avg. | Poor |
|---|---|---|---|---|---|
| SI | 61 | 32 | 7 | 0 | 0 |
| CJC | 44 | 47 | 9 | 0 | 0 |

2. Do you feel the handbook answers questions most frequently raised by your students?

| | Yes | No |
|---|---|---|
| SI | 97 | 3 |
| CJC | 95 | 5 |

3. Check those additional items of information which you feel should be included in this handbook:

| CJC | SI | |
|---|---|---|
| 28 | 34 | Enrollment Forms |
| 26 | 22 | Counselors' Names |
| 32 | 25 | Scholarship Applications |
| 14 | 19 | Other |

4. Does the handbook include material which you feel is unnecessary, such as:

| CJC | SI | |
|---|---|---|
| 12 | 0 | Definitions |
| 12 | 14 | Supply/Demand Information |
| 12 | 0 | Curriculum Information |
| 18 | 44 | Equivalency Sheets |
| 18 | 14 | Transfer Procedures |
| 5 | 14 | Scholarship Information |
| 23 | 14 | Other |

## SECTION IV
## PROGRESS AT THE PILOT CENTERS

Considerable attention was given to the task of establishing pilot centers in which to implement the guideline recommendations found in the bulletin "Partners in Industrial-Technical Teacher Education/The Cooperative Roles of the Community-Junior Colleges and the Senior Institutions." After careful study, the following five pilot centers were chosen: California State College at Long Beach, Florida Atlantic University, Illinois State University, Wayne State University (Michigan), Western Michigan University. The Co-Directors of the project offered both consultative services and guidance to the centers in an attempt to establish viable articulation procedures at these schools. The following paragraphs contain a summation of the activities carried out at each of the pilot centers:

### A. California State College at Long Beach

Correspondence, telephone calls, and personal meetings were employed to brief the Long Beach group on the procedures for implementing the Partnership and/or Pyramid Programs. Long Beach has successfully established articulation programs between themselves and the area community/junior colleges including Cerritos, Compton, Cypress, El Camino, Fullerton, Golden West, Long Beach City, and Rio Hondo.

Meetings were held between the Industrial Arts Department of Long Beach and representatives from each of the cooperating community/junior colleges to establish guidelines relative to program articulation in industrial education. These meetings resulted in written agreements which carefully outlined the general to specific factors leading to improved articulation. A copy of one such agreement (Compton College) follows:

Compton College

A meeting was held with Mr. Mitchell of Compton College, Dr. Lathrop, Chairman of the Industrial Arts Department at CSCLB and Roger Beam, Coordinator of Industrial Technology at Compton College for the purpose of articulating courses to CSCLB. The following statements in reference to articulation were approved by Dr. Lathrop.

1. Forty-five units in general education are required by CSCLB for the credential in Industrial Arts Teaching. Compton College requires forty-three units in the general education requirement. Therefore, a student pursuing this objective would need an additional 2 units in the general education area before graduating from Compton College.

2. Teaching major must have 6 units in English Composition to meet credential requirements.

   a. The student must pass the STEP test at CSCLB in the English areas or they will be required to take English 300A at CSCLB.

3. The requirements for Industrial Arts Major - Lower Division

| FOUNDATION PROGRAM AT CSCLB | CSCLB COURSE | COURSE AT COMPTON COL. EQUIV. TO CSCLB COURSE | UNITS |
|---|---|---|---|
| General Metals | IA-121 | Beg. Machine Shop 50 | 3 |
| Electronics | IA-131 | Intro. to Electronics 52 | 3 |
| Drafting | IA-141 | Eng. Draft. 50<br>or<br>Eng. Graphics I | 2 |
| Printing | IA-151 | Graphic Arts Fund. 50<br>or<br>Prep. of Printed Mat. 51<br>or<br>Letterpress Printing 54<br>or<br>Offset Camera 60<br>or<br>Offset Presswork 62 | 3<br>3<br>3<br>3<br>3 |

| FOUNDATION PROGRAM AT CSCLB | CSCLB COURSE | COURSE AT COMPTON COL. EQUIV. TO CSCLB COURSE | UNITS |
|---|---|---|---|
| Automotive | IA-161 | Elementary Auto Mech. 50 | 3 |
| | | or | |
| | | Elementary Auto Mech. 51 | 3 |
| Photography | IA-210 | Beg. Photo. 50 | 3 |
| Art | 100 | 31A or 32A Elective | |
| Wood | IA-111 | No classes in this area at Compton College | |
| Orientation | IA-181 | " " | |
| Dev. of Ind. & Tech. | IA-284 | No classes in this area at Compton College | |

NOTE: At this point the student has 17 units without Art (do not include Art in the 17 units). The additional three units for the major should be Mathematics Calculation 53 - 3 units.

5. If the student graduates from Compton College, meeting the General Education requirements of 43 units and 20 units in the major, he will have a total of 63 units for transfer, placing him in Junior standing at CSCLB.

6. Comments in reference to students changing a major in Industrial Technology to Industrial Arts teaching major.

   a. As the result of this change, the student will have to spend more time completing degree requirements.

   b. However, the student will have a stronger concentration in his preparation for teaching in the major area.

   c. The student would, as a result of the major change, have two areas of concentration

7. Students having a high concentration of units in one area would revert in the following manner. For example, 24 units in Auto.

   a. Three units would apply to the foundation program.

   b. Seventeen units would apply in the elective area. Note: only 20 units can be accepted from Industrial Technology to the Industrial Arts Teaching Major.

   c. The elective units would apply to the 2nd area of concentration.

   d. The student would select a first area of concentration in some area of Industrial Arts other than the elective units.

   e. In addition to the elective units (17), he must complete 9 units upper division in the area represented by the 17 units.

The developmental program at Long Beach has proceeded to the point where the cooperating community/junior college catalogs now make specific reference to the transfer programs at Long Beach, listing both transferable courses and other requirements and procedures.

From all indications, the articulation program between Long Beach and area community/junior colleges is functioning successfully. This can be offered as a good example of the procedure involved in establishing cooperative programs and the tangible results of careful planning. The continuing success of the program can be assured through continuation of dialogue between both classes of educational institutions.

B. Florida Atlantic University

This university is in a unique position since it operates only at the upper undergraduate and graduate levels. All of the students attending this school are transfers from community/junior colleges. At the start of this program, Florida Atlantic did not have a program of teacher preparation in industrial education. Dr. Robert Wiegman, Dean of the College of Education, has been enthusiastic about starting a program in this area. However, it was necessary to get state department approval for such a curriculum and also to secure adequate funding. Initial planning to establish a new curriculum in this area was started in the Fall of 1969. Since that time, there have been a series of meetings held with representatives from the community/junior colleges and the public schools in Broward, Dade, and Palm Beach Counties to work out details for this proposed new curriculum. The most recent meeting of the Florida Task Force for Preparing Industrial Education Teachers was held in the Spring of 1971. A copy of the report of this meeting follows.

REPORT

Meeting of Florida Task Force for
Preparing Industrial Education Teachers

A luncheon was held on Tuesday, April 20, 1971, during the American Industrial Arts Convention to discuss the establishment of a new program of industrial teacher education at Florida Atlantic University following the plans recommended in the bulletin "Partners in Industrial-Technical Teacher Education/ The Cooperative Roles of the Community-Junior Colleges and the Senior Institutions." Representatives from the three major counties of Broward, Dade, and Palm Beach were present including the county supervisors and the deans of technical studies of the community/junior colleges. In addition to these people, members of the Department of Education at Florida Atlantic University and the two Supervisors of Industrial Arts in Florida were also in attendance.

It was agreed that there is a serious need for a new program of industrial arts teacher education at Florida Atlantic University. This area has been approved by the major planning board of Florida. There was complete professional support from all persons involved for this new program.

The College of Education at Florida Atlantic University was directed by the group to make a proposal to Dr. Carl W. Proehl, Assistant Superintendent, Division of Vocational, Technical, and Adult Education, State of Florida, to secure vocational funds for a teacher educator, secretarial help, and related expenses to begin the program at Florida Atlantic University in the Fall of 1972.

All members present agreed to write a letter of endorsement to Dr. Proehl. It was also indicated by the three county supervisors of industrial arts that there is a great demand for a graduate program in industrial education at Florida Atlantic. This is true because about 80 percent of the industrial arts teachers in these three counties were prepared out-of-state and only 15 percent have master's degrees. It was agreed that the Directors of this program would follow up this recommendation. A meeting was held in May to implement the establishment of the program.

The College of Education at Florida Atlantic University has submitted a proposal to the Board of Regents for special funding to start such a program. While funds were not available for the Fall of 1971, it is hoped that by Fall, 1972, such a program will be implemented. The new program at the University will follow all of the guideline recommendations that have resulted from this study.

C. Illinois State University

Illinois State University has shown an intense interest in the matter of articulation; although the final arrangements with area community/junior colleges are not complete, the efforts do indicate good progress in this direction. Two major effects thus far can be summarized to substantiate this claim.

1. On November 20 and 21, 1970, the Illinois/Indiana Collegiate Industrial Educators' Annual Conference was held at Normal; the major topic was that of senior institution-community/junior college articulation problems. Dr. John L. Feirer was the key speaker, and he presented the issues and gave a report of progress. After this presentation, the following topics were discussed:

   a. Should the community/junior college transfer student come to the senior institution with his technical competencies completed?

   b. Should we have state-wide curriculum plans for industrial-technical teacher education? What are the responsibilities of the community/junior colleges? the senior institutions?

c. What are the problems of the transfer of credit for technical courses? (Example: credit transfer of technical courses taught by tradesmen) How can we resolve these problems?

d. Articulation: How can we best maintain the communication link between the community/junior colleges and the senior institutions?

e. What are the employment opportunities for the 2-year community/junior college technical graduate who obtains the 4-year technology degree?

2. A second meeting was held at the American Vocational Association Convention in New Orleans on December 5, 1970. The results of this meeting also have implications for the articulation program in Illinois. The topic of the meeting was "An Articulated Approach To Occupational Personnel Development in Illinois" and the chairman was Dr. Joe E. Talkington, Chairman of the Department of Industrial Technology at Illinois State University.

The latest communications from Illinois State University indicate that, while they have not completed the formal arrangements for articulated programs, they are moving to accomplish this, hopefully, during the academic year 1972-73. Pursuant to this, there have been discussions with area community/junior colleges and a regional articulation conference has been planned.

D. Wayne State University (Detroit)

At present, Wayne State University is revising its procedures for those students wishing to transfer from community/junior colleges in the Detroit area to Wayne State University to complete a B.S. degree.

They are planning to develop the following types of programs:

1. A transfer student can utilize all of the technical courses taken in a specific area for transfer to become a vocational/ industrial teacher. These students, however, would have to be vocationally certified, to include the necessary occupational experience and passing the trade competency tests. Wayne State has discovered that they have had a 47 percent increase in the number of students transferring into the Industrial Education Department from community/junior colleges in a one-year period. All of these students are interested primarily in the vocational/ industrial programs where a large concentration of technical courses in one area, such as electronics can be utilized.

2. The staff at Wayne State realizes that they must develop a Partnership Program with the various community/junior colleges in their area so students will have another career option; namely, that of becoming industrial arts teachers. However, to date they have not implemented this program in any of the community/ junior colleges. They understand,however, that they must develop this kind of program so that the transfer students will come with technical competencies in a wide variety of areas thus making them suitable candidates for becoming general industrial arts teachers. (Detroit and the metropolitan area is greatly in need of this type of teacher.) What is required,therefore, is to effect the recommendations of the research, as Western Michigan University is presently doing with the colleges in their geographic area. There is great interest among the staff to do this. But time and staff limitations and general college reorganization have, to date, prevented them from implementing the program.

E. Western Michigan University

Western Michigan University's efforts at developing a satisfactory articulation agreement with area community/junior colleges was an outgrowth of work achieved during the original project. Much has been learned regarding the issues relative to articulation, and subsequent contacts with community/junior colleges were indicative of a willingness and readiness to cooperate.

The first program directed specifically toward achieving this goal was a community/junior college conference dealing with problems of administration and articulation. The purposes of the conference were:

1. To discuss the preparation and development of a student transfer handbook to facilitate transfer and alleviate some of the problems involved.

2. To establish a pre-industrial curriculum for those community/junior college students who are anticipating the transfer to a teacher education program.

3. To prepare basic materials for a counselors' handbook that would aid counselors in guiding students wishing to become industrial education teachers.

The results of this conference formed the basis for the final development and eventual publication of the "Handbook for Counselors" and "A Guide for the Transfer Student."

It should be noted that a most important feature of the student transfer bulletin is the equivalency sheets that indicate the courses acceptable as substitutions in the industrial education curriculum at Western Michigan University.

The University and the Industrial Education Department have every intention of continuing this program and seeking ways of improvement.

The original study has had an impact on many states in developing cooperative industrial teacher education programs. A good illustration of this is the work that was done in California beginning in May of 1971 when a series of regional work sessions on the "Community College-State College Articulation of Industrial Arts Teacher Preparation" were held. Over 200 representatives from community colleges, state and private colleges, and the California State Department of Education discussed this problem in depth and developed the following guideline recommendations:

A. All courses at the community/junior college including those in industrial-technical education would be listed as transferable to senior institutions.

B. Senior institutions and community/junior colleges would evaluate the lower division courses for content and value for teacher preparation.

C. Students interested in industrial teacher education would be counseled as soon as possible so that they would take the right general education courses.

D. Students planning to transfer to senior institutions would be encouraged to complete approximately half of their work at the community/junior college including most of the general education requirements.

E. Students should be informed of the requirements for graduation from state colleges so that they realize what requirements are necessary in both general education and technical courses.

F. Senior institutions would accept as many of the industrial-technical lab courses as possible including a major in industrial arts.

G. Committees would be established with representatives from the senior institutions and community/junior colleges to continue to coordinate and articulate the program.

H. Senior Institutions would attempt to develop a common list of beginning industrial-technical courses that could be offered by the community/ junior colleges.

I. The areas that could be included for the preparation of industrial arts teachers are drafting, electronics, graphic arts, auto mechanics, industrial crafts, metals, photography, plastics, power mechanics, and woodworking.

Additional articulation meetings are being held during 1971-72 to implement these recommendations.

## SECTION V
## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. As indicated in the introductory portion of this report, the following purposes of the study were delineated:

1. To survey the 44 states not previous covered in the original research project to determine the value of the bulletin "Partners in Industrial-Technical Teacher Education/The Cooperative Roles of the Community-Junior Colleges and the Senior Institutions" in giving direction to industrial teacher education programs.

2. To work with selected senior institutions in implementing the recommendations set forth in the "Partners" bulletin.

3. To develop a transfer student handbook to serve as a model for other senior institutions to use in preparing their own handbooks.

4. To develop a handbook for community/junior college and high school counselors to use when counseling prospective industrial education students.

5. To publicize the "Partners" bulletin, the "Guide for the Transfer Student," and the "Handbook for Counselors;" and to work with selected community/junior colleges in implementing the use of these handbooks.

B. The aforementioned objectives were achieved in the following manner:

1. The survey was completed and the results generally indicated that:

   a. The professional personnel in community/junior colleges and senior institutions believe the "Partners" bulletin served a real need in

stimulating articulation activities between the two types of institutions. There was general agreement that the problems outlined in the "Partners" bulletin were those confronting both types of institutions. Most felt that there was a greater need for better communication between the community/junior colleges and senior institutions in the form of visitations, conferences, and seminars.

2. The project Co-Directors worked closely with California State College at Long Beach, Florida Atlantic University, Illinois State University, Wayne State University (Detroit), and Western Michigan University in program development and implementation. In each case, the senior institutions became actively engaged in implementing certain of the guidelines (except in the case of Western Michigan University). The Co-Directors have reason to believe that the senior institutions will continue in these efforts, especially as they now have two recently completed handbooks to give further guidance.

3. The "Guide for the Transfer Student" and the "Handbook for Counselors" were developed by the directors under consultation with a team of community/junior college staff members in Southwestern Michigan. A conference was called and several additional sessions were held to further refine and improve the handbooks prior to their publication.

4. The bulletin and the two handbooks received good distribution, and a member of the project team made a personal visit to each of the eight community/junior colleges in the Southwestern Michigan area to advise them relative to using the materials and to receive suggestions and answer questions. This proved to be a most valuable experience.

C. As a result of this study, there is every indication that the problem is broader and more inclusive than just industrial education. All occupational teacher education programs face many of the same problems in terms of utilizing courses from vocational-technical centers and community/junior colleges in preparing teachers. Every state has the same basic question; namely, how to utilize the total resources of the state to do the job most effectively. For those smaller states where there is insufficient demand for specific types of occupational teachers, a regional approach may be more desirable. Obviously, the traditional teacher education methods are not satisfactory.

There is a great need to develop state master plans for preparing occupational teachers. For too many years the major responsibility of preparing these teachers has been concentrated under the control of the teacher education departments in the senior institutions that were former teacher's colleges; rural-oriented, land-grant universities; or the prestigious universities more interested in graduate work than in preparing qualified occupational teachers. All of a state's resources must be used to prepare all types of occupational teachers, particularly in those states where the population groups include the disadvantaged, handicapped, and urban centers. To produce an adequate supply of occupational teachers in each state, there must be major adjustments in teacher education programs. The relationship existing between the community-junior colleges, vocational-technical centers, and senior institutions is vitally important to the health and well-being of the total program of occupational education. Some of the problems yet to be resolved are:

1. What role should the vocational/technical center and community/junior college play in occupational teacher education?

2. What kinds of changes will need to be made in senior institution programs, particularly in the first two years? Obviously, more and more of the senior institutions have or are becoming upper undergraduate and graduate schools.

3. What are the problems involved in preparing teachers for the new and emerging occupational areas not included in the traditional programs now offered in the senior institution?

4. Is it possible to develop an over-all, coordinated program of occupational teacher education in senior institutions where a specific school will be delegated the responsibility for certain teacher ecucation programs and no others?

5. How can a state implement a master plan for occupational teacher education that will utilize the best resources of all areas of the state?

These problems and issues must be resolved if sufficient numbers of qualified occupational teachers are to become available in the years ahead. And the problem becomes even more acute as states become more pressed for funds and as legislators begin to examine the duplication of facilities and effort among senior institutions.

# Handbook for
# COUNSELORS

Conclusions and recommendations presented in this handbook are based upon the extensive research conducted as a part of the research study titled, "Development of Junior/Community College Curricula for Future Teachers of Industrial Education," USOE Sponsored Project No. 7-0074, Grant No. OEG-0-8-070074-3713 (085).

Much of the specific material is the result of comments made by a representative group of counselors and deans of technical studies of community/junior colleges at a work/study conference held on the campus of Western Michigan University in October, 1970. The content has also been reviewed by representative professional personnel in community/junior colleges and senior institutions in various states.

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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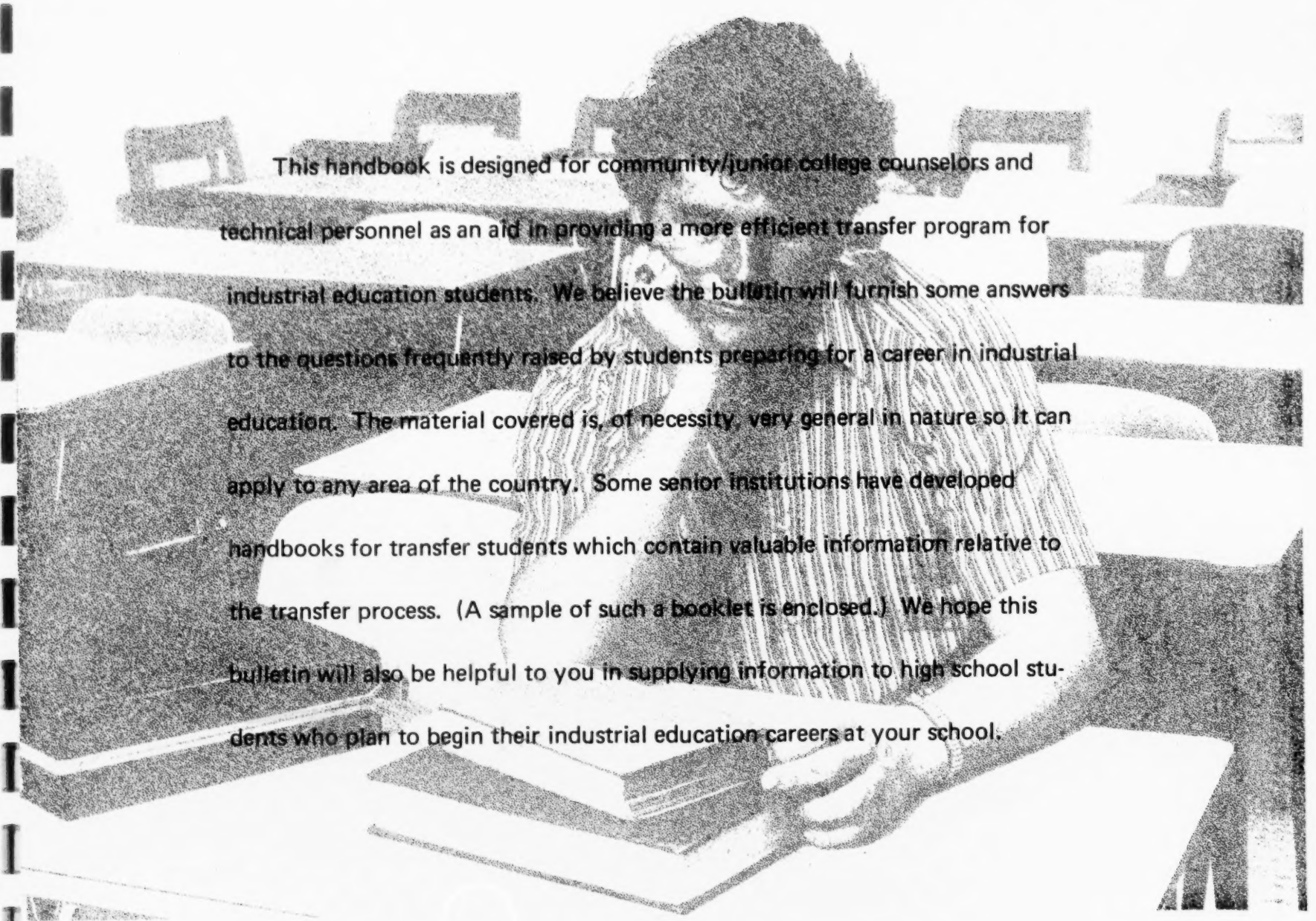
# PREFACE . . .



This handbook is designed for community/junior college counselors and technical personnel as an aid in providing a more efficient transfer program for industrial education students. We believe the bulletin will furnish some answers to the questions frequently raised by students preparing for a career in industrial education. The material covered is, of necessity, very general in nature so it can apply to any area of the country. Some senior institutions have developed handbooks for transfer students which contain valuable information relative to the transfer process. (A sample of such a booklet is enclosed.) We hope this bulletin will also be helpful to you in supplying information to high school students who plan to begin their industrial education careers at your school.

## What is Included in The Term Industrial Education?

Industrial education is a generic term which broadly defines that part of the total education program which includes instruction in technical education, industrial arts, and vocational/industrial education.

Technical education is concerned with programs to prepare technicians. Technicians work on teams with engineers, scientists, supervisors, and skilled craftsmen converting theories and ideas into products and processes. There are two main types of technicians of concern in this bulletin; namely, the engineering technician and the industrial technician. "Engineering technology is that part of the engineering field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational area between the craftsman and the engineer, at the end of the area closest to the engineer." (American Society for Engineering Education) The industrial technician exhibits similar competencies within a narrower range of industry, such as drafting, instrumentation, automotive, printing, etc. Technical programs are normally offered in technical institutes and/or community/junior colleges.

Industrial arts is the study of industry and technology including its tools, materials, products, processes, and occupations. It is the body of related subject matter, or related courses, organized for the development of understanding about the technical, consumer, occupational, recreational, organizational, managerial, social, historical, and cultural aspects of industry and technology. Learning experiences involve activities such as experimenting, designing, constructing, evaluating, and using tools, machines, materials, and processes which provide opportunities for creativity and problem solving. The unique goals of industrial arts are:

To develop an insight and understanding of industry and its place in our culture.

To discover and develop talents, aptitudes, interests, and potentials of individuals for technical pursuits and applied science.

To develop an understanding of industrial processes and practical application of scientific principles.

To develop basic skills in the proper use of common industrial tools, machines, and processes.

To develop problem-solving and creative abilities involving the materials, processes, and products of industry.

Programs may be at levels from K-12, although most specialized classes are offered at the junior and senior high school levels.

Vocational/industrial education, or trade and industrial, is a branch of vocational education which is concerned with preparing people for initial employment or for upgrading or retraining workers in a wide range of trades and industrial occupations. Such occupations involve planning, designing, producing, building, processing, assembling, testing, maintaining, servicing, or repairing any product or commodity. Instruction is provided in basic manipulative skills, safety, and related occupational information in mathematics, drafting, and science required to perform successfully. Programs may be at the secondary or post-secondary levels.

## What is the Relationship of Industrial Education to Occupational Education?

Industrial education is a part of a broader program of occupational education. Occupational education deals with preparation for all of the careers in our economy. It refers to learning experiences related to jobs which make up major employment areas. According to the United States Department of Labor, there are 21,741 separate and distinct occupations. These are described in the Dictionary of Occupational Titles. American education should provide some preparation for all students entering these occupations. The major role of the schools is, however, to provide occupational preparation for the 700 most common occupations that are described in the Occupational Outlook Handbook. Occupational teachers work in programs of business, distributive, health, agriculture, industrial education, home economics, transportation, and other emerging areas. All teachers and supporting educational personnel should contribute to the total occupational education. The Appendix contains a brief summary of the Occupational Outlook Handbook that should serve as a guide for all who are interested in occupational information and counseling.

## What is the Number One Problem In Industrial Education?

The answer to this is a manpower shortage. Specifically, there is a need for a substantial increase in the supply of well-trained teachers and supporting personnel in industrial education. This problem is critical and, if the answer isn't found soon, there will be an insufficient supply of teachers for many of the students who will need training to enter the world of work. This shortage of teachers, if allowed to continue, will be reflected in the numbers of skilled workers and technicians available for American industry. America's industrial growth will suffer for the lack of adequately trained workers.

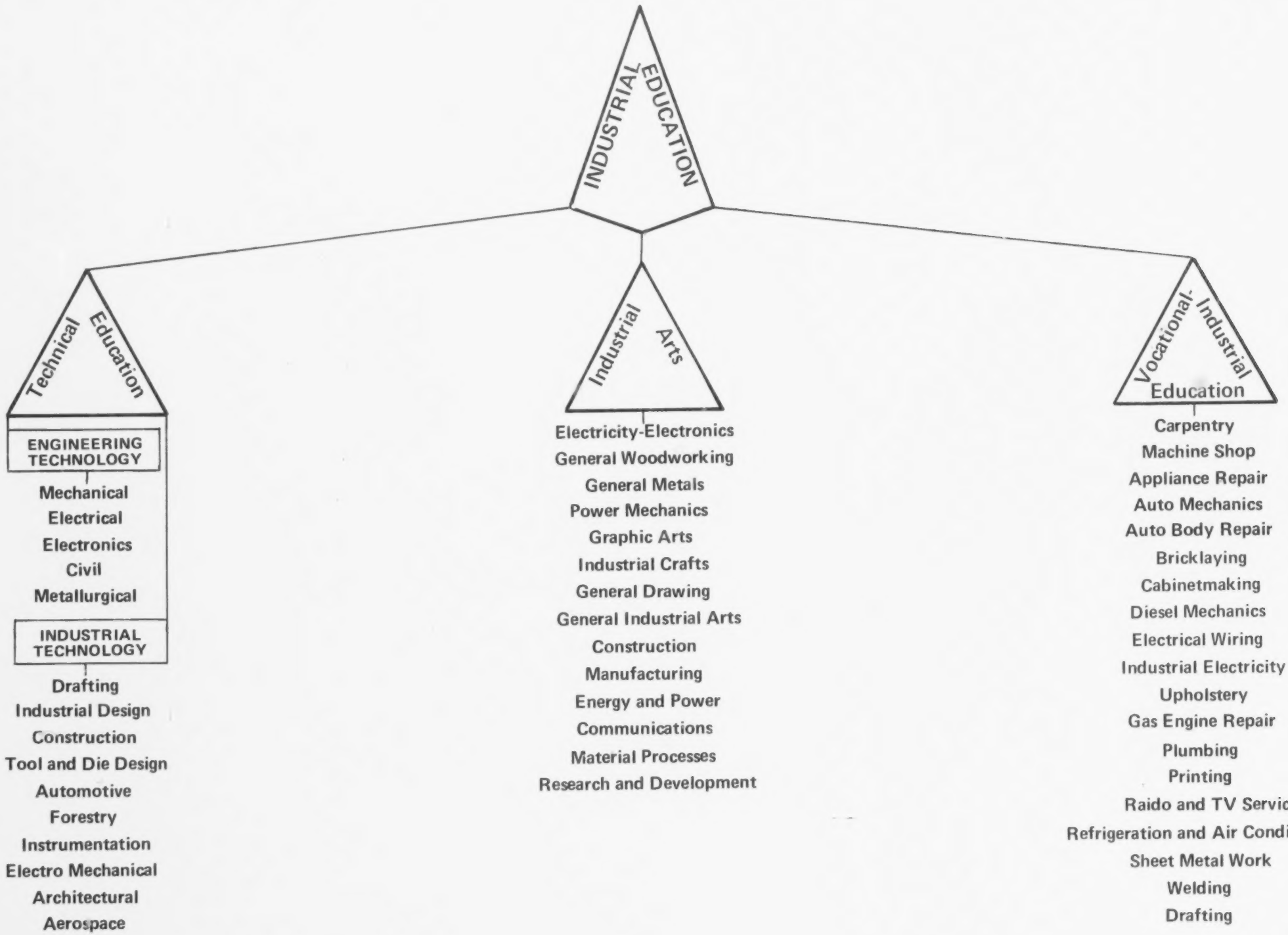

INDUSTRIAL EDUCATION
Technical Education
ENGINEERING TECHNOLOGY
Mechanical
Electrical
Electronics
Civil
Metallurgical
INDUSTRIAL TECHNOLOGY
Drafting
Industrial Design
Construction
Tool and Die Design
Automotive
Forestry
Instrumentation
Electro Mechanical
Architectural
Aerospace
Nuclear
Production
Printing
Industrial Arts
Electricity-Electronics
General Woodworking
General Metals
Power Mechanics
Graphic Arts
Industrial Crafts
General Drawing
General Industrial Arts
Construction
Manufacturing
Energy and Power
Communications
Material Processes
Research and Development
Vocational-Industrial Education
Carpentry
Machine Shop
Appliance Repair
Auto Mechanics
Auto Body Repair
Bricklaying
Cabinetmaking
Diesel Mechanics
Electrical Wiring
Industrial Electricity
Upholstery
Gas Engine Repair
Plumbing
Printing
Raido and TV Service
Refrigeration and Air Conditioning
Sheet Metal Work
Welding
Drafting

FIGURE ONE

## What is the Current and Projected Status of Supply For Beginning Industrial Education Teachers?

As you can see in Figure Two, there are about 119,500 industrial education teachers including approximately 53,500 industrial arts, 52,500 vocational/industrial, and 13,500 technical education teachers. These are full-time teachers and this does not include the thousands who teach part time in various industrial education programs. At least 20,000 new full-time industrial education teachers will be needed annually for additions and replacements according to current demand estimates.

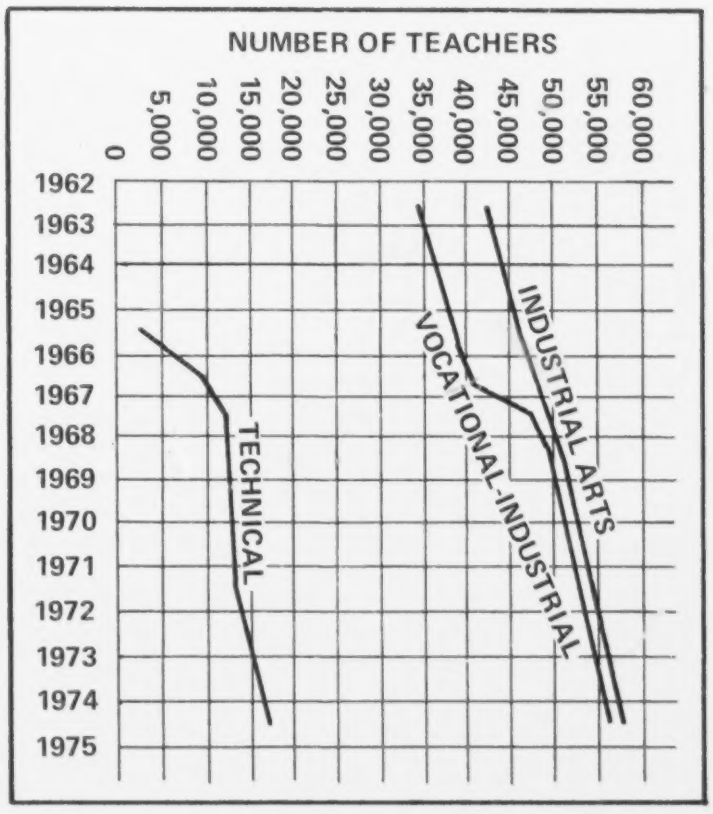



FIGURE TWO

**Total Number of Industrial Arts, Vocational/Industrial, and Technical Education Teachers (USOE)**

## What Are the Teaching Opportunities In Industrial Education?

The major opportunities are as follows:

INDUSTRIAL ARTS IN THE JUNIOR HIGH OR MIDDLE SCHOOL -- A typical teaching assignment includes courses in general industrial arts (some work in metal, wood, drawing, electricity, power, and graphic arts) or courses such as construction, manufacturing, energy and power, communications, and general industry.

INDUSTRIAL ARTS IN THE SENIOR HIGH SCHOOL -- Typical teaching assignment includes specific courses in drafting, woodworking, building construction, metalworking, automechanics, electricity/electronics, graphic arts, plastics, and many others.

VOCATIONAL/INDUSTRIAL (T&I) AT THE UPPER SENIOR HIGH SCHOOL, AREA VOCATIONAL SCHOOL, OR VOCATIONAL DIVISION OF THE COMMUNITY/JUNIOR COLLEGE -- Typical teaching assignment: teach courses in welding, machine shop, carpentry, etc., or related subjects in mathematics and science.

TECHNICAL EDUCATION IN TECHNICAL INSTITUTES AND COMMUNITY/JUNIOR COLLEGES -- Courses taught in the area of specialty, such as metallurgy, electronics, drafting, fluid power, quality control, and others.

## What are the Major Technical Areas in Industrial Arts?

The major technical areas in industrial arts include the following:

DRAFTING including machines, mechanical drawing, machine drawing, engineering graphics, architecture, and drafting related to all technical areas.

ELECTRICITY/ELECTRONICS including electronics technology, electrical wiring, motor repair, radio-tv servicing, industrial electricity, appliance servicing, and instrument repair.

PLASTICS including molding methods, vacuum forming, compression molding, injection molding, laminating, fabricating, and finishing.

GRAPHIC ARTS including hand composition, machine composition, letterpress and bindery, lithography, photography, and other related areas.

METALS including machine shop, sheet metal, welding, foundry, forging, and art metal.

POWER/AUTO includes the sources of energy, power producing machines, methods of power transmission on land, sea, and air, internal combustion engines and applied fluid power.

WOOD including woodworking, millwork, upholstery, building construction, and finishing.

## In Which Technical Areas Are the Shortages Greatest?

The technical areas of electricity/electronics, graphic arts, plastics, and power/auto are the areas which have the greatest teacher shortages. However, there is a need for good industrial education teachers in all technical areas and at all levels, particularly in the intercity secondary and post-secondary schools. Such large urban centers as Chicago, Detroit, Los Angeles, and New York regularly have openings for well-qualified industrial education teachers. An industrial education graduate willing to move to where the jobs are will have no difficulty in securing employment. All of the ten largest states consistently have shortages of industrial education teachers. There are only a few of the smaller states in which there is sometimes a surplus of industrial education graduates.

## How Does One Become an Industrial Education Teacher?

Specifically, the preparation of teachers has developed as follows: (See Figure Four.)

INDUSTRIAL ARTS -- In years past, most industrial arts teachers followed the four-year college route. Students enrolled directly in one of the 230 senior institutions in the United States which offered a degree in industrial arts. Normally, the students who completed the baccalaureate degree secured a beginning teaching position with no further education or work experience. Today, however, most industrial arts teachers begin their preparation in the community/junior colleges. In a recent study, it was found that 70 percent of the industrial arts teachers in preparation in the six states of California, Florida, Illinois, Michigan, New York, and Texas were transfer students from community/junior colleges.

VOCATIONAL/INDUSTRIAL -- Formerly, most of the vocational/industrial teachers were master craftsmen who were selected to teach in vocational programs. These craftsmen were required to take a certain number of professional education courses to qualify as teachers. Presently, about 30 schools in the United States have four-year degree programs in vocational/industrial education. In these programs, students must either have the occupational experience before they attend college or must secure it in a cooperative program as part of their college program. Most states require two or more years of occupational experience to become certified to teach in vocational/industrial programs. The exact amount o occupational experience varies from state to state and is clearly spelled out in each state master plan for vocationa education.

TECHNICAL -- Technical teachers in community/junior colleges and technical institutes come from a variet of sources as can be seen in Figure Three.

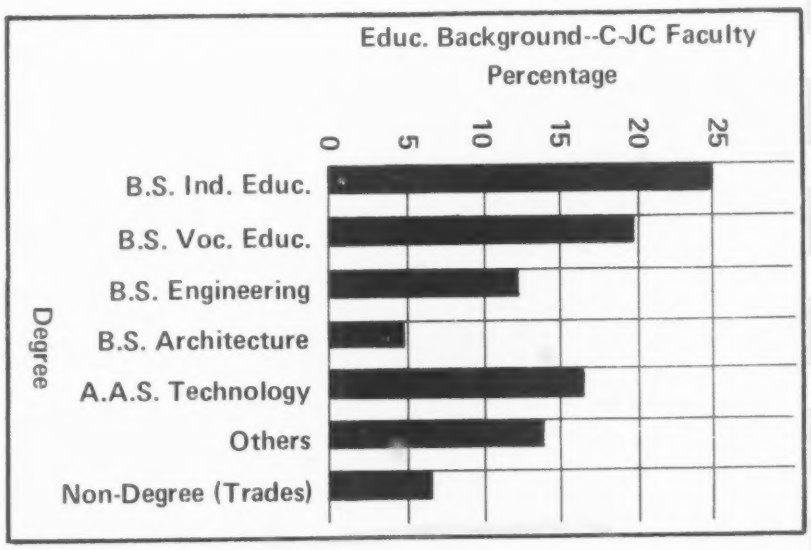



FIGURE THREE

Approximately, 45 percent of the faculty hold B.S. degrees in industrial or vocational education. These teache also have a number of years of teaching experience an many have special qualifications as shown in Figure Five. Most technical teachers have a number of years of exper ence in business or industry.

Sources of Industrial Education Teachers

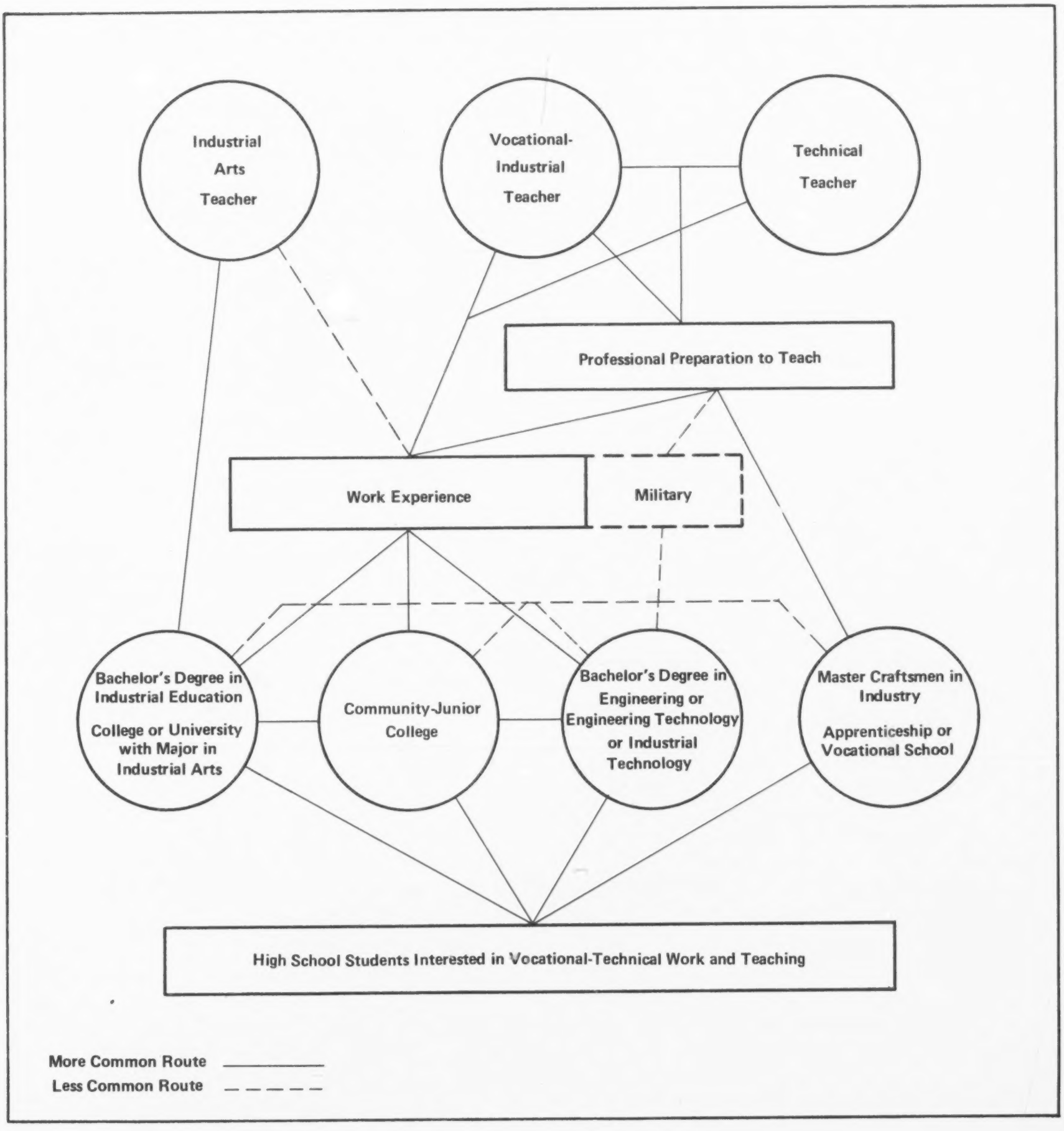

Industrial Arts Teacher
Vocational-Industrial Teacher
Technical Teacher
Professional Preparation to Teach
Work Experience
Military
Bachelor's Degree in Industrial Education
College or University with Major in Industrial Arts
Community-Junior College
Bachelor's Degree in Engineering or Engineering Technology or Industrial Technology
Master Craftsmen in Industry
Apprenticeship or Vocational School
High School Students Interested in Vocational-Technical Work and Teaching
More Common Route
Less Common Route

FIGURE FOUR

Special Qualifications of C-JC Tech. and/or Voc. Staff

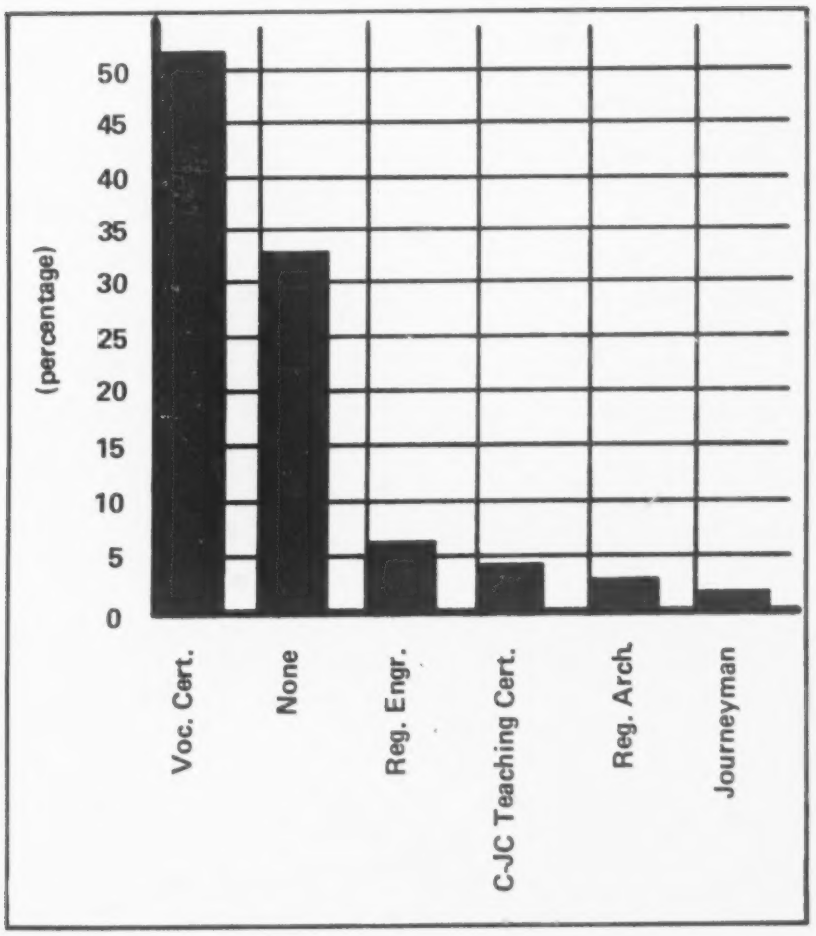



FIGURE FIVE

## *How Can the Community/Junior College And the Senior Institution Cooperate in Preparing Industrial Education Teachers?*

There are two basic approaches that can be utilized. These are defined as the Pyramid and the Partnership programs.

### PYRAMID PROGRAM

The PYRAMID program, which is currently being utilized throughout the country, builds a B.S. or B.A. degree at the senior institution on the two year A.A.S. degree in one of the engineering or industrial technologies offered at the community/junior college. This program is best suited to preparing teachers for advanced senior high school industrial arts, vocational/industrial, and technical education. The senior institution would accept the first two years of the A.A.S. in technology as the first two years of teacher preparation in industrial education. The senior institution then has the responsibility of building onto these first two years to develop a competent teacher in a specific vocational/industrial or technical area. The senior institution can handle the last two years on an individual student basis or may provide a catalog listing of the specific requirements necessary to complete the degree beyond the first two years of the A.A.S. program. The time needed to complete a degree under the PYRAMID program will vary from school to school and with the kind of program into which the student transfers. It will depend largely on how many of the technical credits will transfer. Many senior institutions have a program that requires only two more years to complete a B.S. degree. The technical specialty, however, must be the same as the one the student completed at the community/junior college. For example, if the student is an electricity/electronics major, then his teaching specialty must be in that area. He cannot complete a general industrial arts degree in two years in most institutions. It is for this reason that a second program has been recommended.

### PARTNERSHIP PROGRAM

The PARTNERSHIP program, or the two and two approach, is a pre-industrial program for community/junior colleges. This program would outline a specific curriculum at the community/junior college designed especially for students who are planning to complete a teaching degree in industrial education. In this type of program, cooperation between interested personnel in the community/junior college and the senior institution must agree on such matters as:

ACADEMIC REQUIREMENTS in each of the two institutions and how these may be transferred.

TECHNICAL OFFERINGS in the community/junior college which are suitable for teacher preparation in industrial education. The student should take courses in as many technical areas as are available. Beginning courses in drafting, electricity/electronics, metalworking, and others should be selected.

NEW COURSES needed in a technical or professional area.

The two-year, pre-industrial teacher curriculum should be worked out so that an articulation agreement can be reached between the two institutions. The program should be included in the community/junior college catalog as another career opportunity. Community/junior colleges, in turn, should advise high school seniors of the opportunities for beginning their preparation as industrial education teachers at the community/junior college level.

The curriculum listed in the community/junior college catalogs should outline specific courses to be taken the first two years of this program. Whenever possible, at least one professional education course should be offered during the first two years to orient students to industrial education teaching.

Under this approach, a student could come to the senior

institution and complete a general industrial arts degree in two years. However, he must have taken the pre-industrial curriculum.

## Is College Transfer Credit Usually Given for Work Experience?

Many institutions provide college credit for work experience for those students who plan to become vocational/industrial teachers, providing the work experience is in the same area as the technical specialty they plan to teach. The amount of college credit varies, ranging from 12 to 24 semester hours, and is usually specified in the college catalog.

## What Are the Other Occupational Opportunities For a student Who Specializes In the Field of Industrial Education?

There are many opportunities for the student who graduates with a major in industrial education to enter industry. Approximately 30 percent of all industrial education majors do choose this route rather than teaching. There are positions available in educational programs in industry such as training directors, supervisors, field personnel, and related jobs. Industry is also looking for personnel with a general industrial arts background for positions in mid-management, supervision, and in many areas of product development.

## What Value is the Community/ Junior College Transfer Student Handbook to the Counselor?

Some senior institutions are developing a transfer handbook for students who plan to transfer from the technical programs of the community/junior college to the industrial education program. This type of bulletin outlines in detail course requirements, curriculum, fees, transfer problems, counseling information, etc. Heads of industrial education departments in senior institutions are generally willing to work with community/junior colleges in developing specific materials for that institution. Every opportunity should be utilized to develop a working relationship between the community/junior college and the senior institution in your geographic area.

## Where can a Student Enroll For Programs in Industrial Education?

The Appendix contains a list of the major colleges and universities that offer degrees in industrial arts, vocational/industrial, and technical education. Any student interested in transferring to one of these institutions should write to the head of the industrial education department at the earliest opportunity to determine how his work and course credits can be transferred.

## What Kind of Information Should Counselors at the Community/Junior College Give to High School Students Interested in Industrial Education Teaching?

Counselors should acquaint high school students with industrial education so that they can begin their preparation to become industrial education teachers in the community/junior college. If they plan to become general industrial education teachers, it is highly desirable that they follow a pre-industrial curriculum so that they can get a broad balance of courses in general studies and a variety of technical areas. The students who plan to become vocational/industrial teachers should be aware of the fact that they must secure two or more years of industrial experience and complete the four years of the college program. In some cases, senior institutions do provide for students to secure part of the industrial experience during the regular school year. However, if they are transfer students from community/junior colleges, there will be little time to secure this industrial experience unless it is done before entering the senior institution.

It is recommended that the community/junior college provide a simple folder describing the pre-industrial teacher curriculum that can be started at the particular community/junior college. It is also recommended that a slide presentation be prepared showing the opportunities in a variety of technical programs available at the community/junior college.

# APPENDIX . . .

## Colleges and Universities Offering Degrees in Industrial Arts, Vocational/Industrial and Technical Education

ALABAMA
Alabama Agricultural and Mechanical University
Auburn University
Tuskegee Institute
University of Alabama

ARIZONA
Arizona State University
Northern Arizona University

ARKANSAS
Agricultural, Mechanical, and Normal College
Arkansas A&M College
State College of Arkansas
University of Arkansas

CALIFORNIA
California State College at Long Beach
California State Polytechnic College
Chico State College
Fresno State College
Humboldt State College
California State College at Los Angeles
Pacific Union College
San Diego State College
San Francisco State College
San Jose State College
University of California (master's degree only)

COLORADO
Adams State College
University of Northern Colorado
Colorado State University
Southern Colorado State College
Western State College of Colorado

CONNECTICUT
Central Connecticut State College
University of Connecticut

FLORIDA
Florida A&M University
Florida State University
University of Florida
University of Miami
University of South Florida
University of Tampa
University of West Florida

GEORGIA
Berry College
Georgia Southern College
Savannah State College
University of Georgia

HAWAII
Church College of Hawaii
University of Hawaii

IDAHO
University of Idaho

ILLINOIS
Bradley University
Eastern Illinois University
Illinois State University
Chicago State College
Northern Illinois University
Southern Illinois University
University of Illinois
Western Illinois University

INDIANA
Ball State University
Indiana State University
Purdue University

IOWA
Iowa State University
University of Northern Iowa
Westmar College
William Penn College

KANSAS
Bethel College
Fort Hays Kansas State College
Friends University
Kansas State College of Pittsburg
Kansas State Teachers College
McPherson College
Wichita State University

KENTUCKY
Berea College
Eastern Kentucky University
Kentucky State College
Morehead State University

Murray State University
University of Kentucky
Western Kentucky University

LOUISIANA
Grambling College
Louisiana State University
Northwestern State University
Southeastern Louisiana University
Southern University and A&M College
University of Southwestern Louisiana

MAINE
University of Maine at Portland-Gorham

MARYLAND
University of Maryland--Eastern Shore
University of Maryland (College Park)

MASSACHUSETTS
Fitchburg State College

MICHIGAN
Andrews University
Central Michigan University
Eastern Michigan University
Ferris State College
Michigan State University
Northern Michigan University
The University of Michigan
Wayne State University
Western Michigan University

MINNESOTA
Bemidji State College
Mankato State College
Moorhead State College
St. Cloud State College
University of Minnesota (Minneapolis)
University of Minnesota (Duluth)
Winona State College

MISSISSIPPI
Alcorn Agricultural and Mechanical College
Jackson State College
Mississippi State University
Mississippi Valley State College
University of Southern Mississippi

MISSOURI
Central Missouri State College
Northeast Missouri State College
Northwest Missouri State College
Southeast Missouri State College
Southwest Missouri State College
University of Missouri

MONTANA
Montana State University
Northern Montana College
Western Montana College

NEBRASKA
Chadron State College
Kearney State College
Peru State College
University of Nebraska (Lincoln)
University of Nebraska at Omaha
Wayne State College

NEVADA
University of Nevada

NEW HAMPSHIRE
Keene State College

NEW JERSEY
Glassboro State College
Montclair State College
Newark State College
Rutgers University The State University of New Jersey
Trenton State College

NEW MEXICO
Eastern New Mexico University
New Mexico Highlands University
University of New Mexico

NEW YORK
The City College of the City University of New York
City University of New York
Columbia University (master's degree only)
New York University
State University College at Buffalo
State University College at Oswego

NORTH CAROLINA
North Carolina Agricultural & Technical State University
Appalachian State University
East Carolina University
Elizabeth City State University
North Carolina State University at Raleigh
Western Carolina University

NORTH DAKOTA
North Dakota State School of Science
University of North Dakota (Grand Forks)

OHIO
Bowling Green State University
Central State University
Kent State University

Miami University
Ohio Northern University
The Ohio State University
Ohio University
The University of Akron
University of Cincinnati
University of Toledo
Wilmington College

OKLAHOMA
Central State College
East Central State College
Langston University
Northeastern State College
Northwestern State College
Oklahoma State University
Panhandle State College
Southeastern State College
Southwestern State College

OREGON
Oregon State University

PENNSYLVANIA
California State College
Cheyney State College
Millersville State College
The Pennsylvania State University
Temple University
University of Pittsburgh

RHODE ISLAND
Rhode Island College

SOUTH CAROLINA
Clemson University
South Carolina State College

SOUTH DAKOTA
Black Hills State College
Dakota State College
Northern State College
South Dakota State University
Southern State College

TENNESSEE
Austin Peay State University
East Tennessee State University
Memphis State University
Middle Tennessee State University
Southern Missionary College
Tennessee State University
Tennessee Technological University
The University of Tennessee

TEXAS
Abilene Christian College
East Texas State University
North Texas State University
Prairie View Agricultural and Mechanical College
Sam Houston State University
Southwest Texas State University
Southwestern Union College
Sul Ross State University
Tarleton State College
Texas A&M University
Texas A&I University
Texas Southern University
University of Houston
West Texas State University

UTAH
Brigham Young University
Southern Utah State College
Utah State University

VERMONT
University of Vermont

VIRGINIA
Hampton Institute
Old Dominion University
Virginia Polytechnic Institute & State University
Virginia State College
Norfolk State College

WASHINGTON
Central Washington State College
Eastern Washington State College
University of Washington
Walla Walla College
Washington State University
Western Washington State College

WEST VIRGINIA
Fairmont State College
Salem College
West Virginia Institute of Technology
West Virginia State College
West Virginia University

WISCONSIN
Stout State University
University of Wisconsin
Wisconsin State University--Platteville

WYOMING
University of Wyoming

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **PROFESSIONAL AND RELATED OCCUPATIONS** | | | |
| **BUSINESS ADMINISTRATION AND RELATED PROFESSIONS** | | | |
| Accountants | 500,000 | 33,000 | Excellent opportunities. Strong demand for college trained applicants. Graduates of business and other schools offering thorough training in accounting should have good prospects. |
| Advertising workers | 140,000 | 5,700 | Many young people attracted to this field. Hence, stiff competition, but good opportunities will continue for those having college-level training in marketing, journalism, or business administration and a flair for language. |
| Marketing research workers | 20,000 | 2,700 | Very good opportunities for college graduates well prepared in marketing research methods and statistics. Marketing research organizations expected to expand, and many new ones will emerge. |
| Personnel workers | 110,000 | 6,900 | Favorable outlook. Opportunities best for college graduates. New workers needed for recruiting, interviewing, and related activities. More people will probably be engaged in psychological testing and labor-management relations. |
| Public relations workers | 100,000 | 8,800 | Demand expected to grow as population increases and general level of business rises. Increases in amount of funds spent on public relations will continue. |
| **CLERGYMEN** | | | |
| Protestant clergymen | 244,000 | 11,000 | Supply of well-qualified Protestant ministers will probably continue to be less than demand. |
| Rabbis | 6,000 | 300 | The supply of rabbis will probably be inadequate to meet expanding needs of Jewish congregations and other organizations desiring their services. |
| Roman Catholic priests | 62,000 | 2,800 | Growing number needed. Number of ordained priests insufficient to meet the needs of newly established parishes, expanding colleges, and institutional needs. |
| **CONSERVATION OCCUPATIONS** | | | |
| Foresters | 25,000 | 1,000 | Good opportunities. Factors contributing to increased demand are expanded need for forest products; use of forests for recreational purposes; and growing awareness of need to conserve and replenish our forest resources. |
| Forestry aids | 13,000 | 900 | Prospects will be especially good for those with post-high school training in a forestry curriculum. |
| Range managers | 4,000 | 200 | Favorable opportunities, particularly in Federal agencies. Demand will be especially good for well-qualified persons having advanced degrees to fill research and teaching positions. |
| **COUNSELING OCCUPATIONS** | | | |
| Employment counselors | 5,300 | 700 | Excellent opportunities for those having a master's degree or recognized experience in the field. College graduates with a bachelor's degree and 15 hours in counseling courses will find many opportunities as trainees in State and local employment service offices. |
| Rehabilitation counselors | 12,000 | 1,050 | Shortage occupation; excellent opportunities particularly for persons having graduate training in rehabilitation counseling or in related fields. |
| School counselors | 54,000 | 3,800 | Shortage area. Excellent opportunities. Very rapid employment increase, reflecting continued strengthening of counseling services and some increase in secondary school enrollments. |
| **ENGINEERS** | **1,100,000** | **53,000** | **Very good opportunities. Applicants need to be well-grounded in fundamentals to avoid skill obsolescence.** |
| Aerospace | 65,000 | 1,400 | Favorable opportunities and moderate increase in requirements related to continuing developments in supersonic, subsonic, and vertical lift aircraft as well as advancement in space and missile activities. |
| Agricultural | 12,000 | 400 | Moderate growth in demand stimulated by growing mechanization of farm operations, increasing emphasis on conservation of resources, and the broadening use of agricultural products and wastes as industrial raw materials. |
| Ceramic | 10,000 | 400 | Excellent opportunities for new graduates. Growth of programs related to nuclear energy, electronics, and space programs will provide many opportunities. |
| Chemical | 50,000 | 1,600 | Excellent opportunities. Growth factors related to expansion of the chemical industry and large expenditures for research and development. |
| Civil | 180,000 | 11,500 | Expanding opportunities related to growing needs for housing, industrial buildings, and highway transportation systems. Work related to urban environmental problems such as air pollution may also require additional civil engineers. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Electrical** | 230,000 | 12,500 | Rapid growth related to demand for electrical equipment to automate and mechanize production processes, especially for items such as computers and numerical controls for machine tools and for electrical and electronic consumer goods. |
| **Industrial** | 120,000 | 7,200 | Increasing complexity of industrial operations, expansion of automated processes, and continued growth of the Nation's industries are expected to increase demand. |
| **Mechanical** | 215,000 | 8,600 | Rapid employment growth due to demand for industrial machinery and machine tools and increasing technological complexity of industrial machinery and processes. |
| **Metallurgical** | 6,000 | 300 | Increasing number of workers will be needed to develop new metals and alloys as well as adapt current ones to new needs, and to solve metallurgical problems connected with efficient use of nuclear energy. |
| **Mining** | 5,000 | 100 | Growing demand, to work with newly discovered mineral deposits and devise more efficient methods to mine low grade ores, as well as develop oil shale deposits. |
| **HEALTH SERVICE OCCUPATIONS** | | | |
| **Physicians** | 295,000 | 20,000 | Shortage occupation. Excellent opportunities. Limited capacity of medical schools restricts supply as demand increases steadily. |
| **Osteopathic physicians** | 12,000 | 800 | Excellent job prospects. Greatest demand in areas where osteopathy is widely accepted method of treatment. |
| **Dentists** | 100,000 | 4,900 | Very good opportunities. However, limited capacity of dental schools will restrict entrants. |
| **Dental hygienists** | 16,000 | 2,400 | Demand will continue to exceed supply. Excellent opportunities, particularly for part-time workers. |
| **Dental laboratory technicians** | 27,000 | 2,100 | Very good opportunities for well-qualified technicians and trainees. Best sources for salaried jobs are commercial laboratories and the Federal Government. |
| **Registered nurses** | 660,000 | 65,000 | Current shortage; very favorable opportunities. Steadily rising demand accompanied by increasing supply, as training facilities and financial aid expand. |
| **Licensed practical nurses** | 320,000 | 48,000 | Employment opportunities will increase rapidly as these workers are utilized to a greater extent to provide increasing nursing services. |
| **Optometrists** | 17,000 | 800 | Favorable prospects. Graduates of optometry schools expected to lag behind demand. |
| **Pharmacists** | 121,000 | 4,400 | Gradual increase in new positions anticipated. |
| **Podiatrists** | 8,500 | 200 | Favorable opportunities for new graduates to establish their own practices as well as to enter salaried positions. |
| **Chiropractors** | 16,000 | 900 | Outlook favorable; uncrowded field. Prospects will be best in areas where chiropractic is most fully accepted as a method of treatment. |
| **Occupational therapists** | 7,000 | 1,500 | Shortage occupation. Public interest in rehabilitation of the disabled and the success of established therapy programs will continue to stimulate demand. |
| **Physical therapists** | 14,000 | 2,800 | Excellent prospects. Demand expected to exceed supply, as rehabilitation services expand. |
| **Speech pathologists and audiologists** | 18,000 | 2,300 | Good opportunities. Since most States require master's degree, trained applicants are in limited supply. |
| **Medical laboratory workers** | 100,000 | 12,800 | Expanding opportunities as physicians increasingly depend upon laboratory tests in routine physical checkups as well as in the diagnosis and treatment of disease. Particularly strong demand for technologists having graduate training in biochemistry, microbiology, immunology, and virology. |
| **Radiologic technologists** | 75,000 | 7,300 | Very good prospects for both full-time and part-time employment. Expansion in use of X-ray equipment in diagnosing and treating diseases strong factors underlying rise in demand. |
| **Medical record librarians** | 12,000 | 1,400 | Shortage field; very good opportunities. More hospitals and increasing volume and complexity of hospital records will contribute to growing demand. |
| **Dietitians** | 30,000 | 2,700 | Shortage occupation. Increasing opportunities for full-time and part-time work. Growth related to expansion of hospitals and nursing homes. |
| **Hospital administrators** | 15,000 | 900 | Excellent prospects for those with master's degree in hospital administration. Applicants will have difficulty entering this field without graduate training. |
| **Sanitarians** | 10,000 | 600 | Very favorable prospects as State and local health agencies expand activities in environmental health. |
| **Veterinarians** | 24,000 | 1,400 | Very good prospects. Although demand is expected to expand, supply will be restricted by limited capacities of schools of veterinary medicine. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **MATHEMATICS AND RELATED OCCUPATIONS** | | | |
| Mathematicians | 65,000 | 4,600 | Favorable employment opportunities for those having graduate degrees and for well-qualified persons having bachelor's degrees. |
| Statisticians | 23,000 | 1,600 | Good opportunities. Widespread application of statistical methods should strengthen demand in industry, government, and in colleges and universities. |
| Actuaries | 4,000 | 300 | Excellent opportunities because of rising number of insurance policies. Qualified graduates who have passed some actuarial examinations will be in particular demand as trainees. |
| **NATURAL SCIENCE OCCUPATIONS** | | | |
| Geologists | 22,800 | 800 | Favorable prospects for persons who have graduate degrees; those with only the bachelor's degree, including those who rank high academically, will face some competition for the few available entry positions. |
| Geophysicists | 6,800 | 300 | Good job prospects especially for those having a graduate degree. |
| Meteorologists | 4,000 | 200 | Good opportunities. Space-age activities contributing to demand. Those with advanced degrees will be in special demand to conduct research, teach in colleges and universities, and engage in management and consulting work. |
| Oceanographers | 5,200 | 500 | Those with advanced degrees will have best opportunities. Growing recognition of importance of the oceans to the Nation's welfare and security has heightened interest in oceanography and has opened new fields for specialists. |
| **LIFE SCIENCE OCCUPATIONS** | | | |
| Life scientists | 170,000 | 9,900 | Very good opportunities for graduate degree holders, particularly for research in medicine, health, and environmental quality control. Those having only a bachelor's degree may work as research assistants or technicians. |
| Biochemists | 11,000 | 700 | Very good prospects. Ph.D.'s will be in special demand to do independent research and teach. Greatest demand for medical research. |
| **PHYSICAL SCIENTISTS** | | | |
| Chemists | 130,000 | 8,800 | Very good prospects, especially for those having advanced degrees, to teach and do research. Increased research and development expenditures will create new jobs. New products resulting from research also create other types of work. |
| Physicists | 45,000 | 3,200 | Favorable opportunities, particularly for those having advanced degrees. Strong demand in teaching, research, and in various science and engineering programs. |
| Astronomers | 1,400 | 100 | The higher level professional positions will continue to be filled mainly by persons having the doctorate. Well qualified persons having only a bachelor's or a master's degree will have good prospects primarily as research and technical assistants. |
| **PERFORMING ARTISTS** | | | |
| Actors and actresses | 14,000 | 900 | Overcrowding to persist. Applicants outnumber many times the jobs available. Moreover, many actors are employed in their profession for only a small part of the year. |
| Dancers | 23,000 | 1,400 | Few full-time jobs and large number of applicants. Outlook for those qualified to teach will be much better than for those trained only as performers. |
| Musicians and music teachers | 166,000 | 8,600 | Overcrowded field. Keen competition for performers; prospects brightest for teaching. Slight employment increase expected. |
| Singers and singing teachers | 60,000 | 3,100 | Keen competition for performers. Better chances for teachers. Little growth likely. |
| **SOCIAL SCIENTISTS** | | | |
| Anthropologists | 3,000 | 200 | Excellent opportunities for Ph.D.'s. Those with only the master's likely to face persistent competition. |
| Economists | 31,000 | 2,200 | Excellent opportunities for those having graduate degrees, particularly in teaching and research. Applicants having B.A. degrees will find many opportunities in government and as management trainees in industry. |
| Geographers | 3,900 | 200 | Favorable outlook. Strong demand in teaching and research for those with graduate degrees. Government needs are related to regional development, urban and resource management planning, and interpretation of maps. |
| Historians | 14,000 | 800 | Excellent opportunities in teaching and archival work for Ph.D.'s. Those with only a master's or less will find positions scarce; high school teaching available for those meeting certification requirements. |
| Political scientists | 11,400 | 800 | Very good prospects, especially for Ph.D.'s interested in college teaching. More limited prospects for those having only a master's or less. Demand in government for work related to foreign affairs. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Sociologists** | 10,000 | 600 | Majority of new positions will be in teaching. Best opportunities for Ph.D.'s. Very good opportunities for research workers in rural sociology, community development, population analysis, public opinion research, and medical sociology. |
| **TEACHERS** | | | |
| **College and university teachers** | 286,000 | 17,000 | Good opportunities, especially for Ph.D.'s; many opportunities, particularly in junior colleges, for those having master's degrees. Shortages likely in some subject fields. |
| **Kindergarten and elementary school teachers** | 1,230,000 | 56,300 | Number of qualified teachers may exceed openings if present enrollment projections and trends in number of newly trained teachers continues. Greater emphasis expected to be placed on quality of applicant's training and academic achievement. |
| **Secondary school teachers** | 940,000 | 40,000 | A slowing of enrollment growth may be accompanied by an increase in college graduates trained to teach. Greater emphasis expected to be placed on type and quality of an applicant's training and academic achievement. Demand may exceed supply in some geographical areas and in some subjects. |
| **TECHNICIANS** | | | |
| **Draftsmen** | 295,000 | 15,300 | Favorable prospects, especially for those having post-high school drafting training. Well-qualified high school graduates in demand for some types of jobs. |
| **Engineering and science technicians** | 620,000 | 31,000 | Very good opportunities. Demand strongest for graduates of post-secondary technician training schools to fill more responsible jobs. Industrial expansion, complexity of products, and manufacturing processes increasing demand. |
| **WRITING OCCUPATIONS** | | | |
| **Newspaper reporters** | 37,000 | 1,800 | Good opportunities for the well-qualified who have demonstrated talent. Others face competition, especially on large city dailies. Small town papers offer most openings. |
| **Technical writers** | 30,000 | 1,300 | Very good prospects for well-qualified writers. Many opportunities for beginners having good writing ability and appropriate education. |
| **OTHER PROFESSIONAL AND RELATED OCCUPATIONS** | | | |
| **Airline dispatchers** | 1,200 | 50 | Little or no employment change as improved communication facilities enable dispatchers at major terminals to dispatch aircraft at other airports. |
| **Air traffic controllers** | 14,600 | 425 | Moderate employment increase, despite greater use of automated equipment, as airline traffic increases. |
| **Architects** | 34,000 | 2,300 | Good prospects in this rapidly growing field as volume of nonresidential construction expands. Demand will be stimulated also by urban redevelopment and city and community planning projects. |
| **Broadcast technicians** | 20,000 | 400 | Slight increase in employment, despite technical advances, such as automatic switching and programing, automatic operation logging, and remote control of transmitters which limit job opportunities. Color television, which requires more maintenance and skill than black and white equipment, will increase demand. |
| **College placement officers** | 2,500 | 200 | Prospects best for recent college graduates seeking beginning positions, particularly at their own alma maters. College and university emphasis on the student personnel service aspect of higher education will increase demand. |
| **Commercial artists** | 50,000 | 1,900 | Good opportunities for the talented and well trained. Young people having only average ability and little specialized training will encounter competition for beginning jobs and limited opportunities for advancement. |
| **Flight engineers** | 7,500 | 225 | Rapid increase in employment as heavier jet-powered aircraft, requiring flight engineers, come into wider use. |
| **Ground radio operators and teletypists** | 8,200 | 225 | Employment may decline somewhat because of more automatic communications equipment. |
| **Home economists** | 100,000 | 7,800 | Greatest demand will be for teachers. Increased national focus on the needs of low-income families may also increase demand. |
| **Industrial designers** | 10,000 | 300 | Employers will seek applicants with a college degree and outstanding talent. Entrants likely to encounter keen competition from creative persons with engineering, architectural, and related educational backgrounds. |
| **Interior designers and decorators** | 15,000 | 700 | Good opportunities for talented graduates. Those having no formal training will find jobs increasingly difficult to obtain. |
| **Landscape architects** | 8,500 | 500 | Profession will expand because of continued growth of metropolitan areas with their needs for parks and recreational facilities, increasing public construction including housing, and rising interest in city and regional planning. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Lawyers** | 270,000 | 14,500 | Very good prospects for graduates from widely recognized law schools and those who rank high in class. Others may encounter difficulty finding salaried jobs as lawyers. The increased use of legal services by low- and middle-income groups will add to the long-term growth in demand. |
| **Librarians** | 106,000 | 8,200 | Excellent prospects. Shortages, particularly in school libraries, expected to continue despite anticipated increase in number of library school graduates. |
| **Models** | 50,000 | 1,700 | Full-time modeling should remain highly competitive. Favorable part-time opportunities. |
| **Photographers** | 60,000 | 2,200 | Competition keen in portrait and commercial fields, but demand will continue strong for industrial photographers. |
| **Pilots and copilots** | 52,000 | 1,800 | Very rapid increase in employment to the extent that increased traffic exceeds increased carrier capacity. |
| **Programers** | 175,000 | 23,000 | Sharpest employment increase in firms using computers to process business records and control manufacturing processes. Changes in job function related to advances in techniques and equipment will eliminate much routine work. Increasing demand for qualified programers and systems analysts in science and engineering programs. |
| **Psychologists** | 32,000 | 3,100 | Excellent opportunities for those having a Ph.D. Competition likely to be keen for those having an M.A. Expansion of health services, counseling, testing, and teaching will contribute to demand. |
| **Radio and television announcers** | 14,000 | 600 | Moderate increase in employment as new radio and television stations open; however, automatic programing will limit growth. Entry jobs easier to get in radio than in television because of the greater number of radio stations, especially small ones, that hire beginners. |
| **Recreation workers** | 40,000 | 4,100 | Current shortage. Excellent opportunity for well-qualified workers, particularly in local governments, voluntary agencies, hospitals, and youth-serving organizations. |
| **Social workers** | 160,000 | 16,700 | Excellent opportunities for those having master's degree in social work; very good opportunities for those having a bachelor's degree. Many part-time jobs for qualified and experienced women. |
| **Surveyors** | 45,000 | 2,600 | Best prospects for persons having post-secondary school training in surveying. Demand will be stimulated by expanding urban and highway development. |
| **Systems analysts** | 150,000 | 27,000 | Excellent opportunities; one of fastest growing professions. Qualified workers difficult to obtain because of competition from other fields, especially mathematics and science. |
| **Urban planners** | 7,000 | 800 | Shortage of qualified planners in this small, rapidly growing field. Very good prospects with government in health planning, model cities programs, and intergovernment planning relations. |
| **MANAGERIAL OCCUPATIONS** | | | |
| **Bank officers** | 125,000 | 9,900 | Very rapid employment increase, as banks expand. However, competition keen, as banks rely on "promotion from within" to fill most positions. |
| **Conductors (railroad)** | 38,000 | 2,500 | Despite increased freight traffic, little employment change. As passenger traffic continues to decline, freight trains get longer and yard operations become more mechanized. |
| **Industrial traffic managers** | 15,000 | 500 | Strong demand expected for specialists who know how to classify products to obtain the lowest possible freight rates, choose carriers best able to handle each shipment, and otherwise protect their companies from excessive shipping charges. |
| **Managers and assistants (hotel)** | 150,000 | 9,500 | Moderate employment increase as additional hotels, motels, and motor hotels are built. Hotel administration graduates will have advantage. |
| **Purchasing agents** | 140,000 | 6,700 | Very good opportunities. Demand strong for business administration graduates who have had courses in purchasing or engineering and science to work in firms manufacturing chemicals, complex machines, and other technical products. |
| **CLERICAL AND RELATED OCCUPATIONS** | | | |
| **Bank clerks** | 400,000 | 29,500 | Moderate employment increase. Data processing will slow growth. Sharpest increases in clerical vocations related to data processing. Decline may occur in occupations such as check sorters and bookkeeping machine operators. |
| **Bank tellers** | 230,000 | 20,000 | Very rapid employment growth as banks expand services to urban population. Increasing proportion will be part-time tellers for peak hours. |
| **Bookkeeping workers** | 1,200,000 | 78,000 | Demand expected to outpace labor-saving impact of office machines. |
| **Cashiers** | 730,000 | 69,000 | Opportunities best for persons having typing, bookkeeping, or other special skills. Many opportunities for part-time workers. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Clerks (railroad)** | 93,000 | 2,700 | Continued decline in employment as electronic business machines process freight bills and record freight car movements. |
| **Dental assistants** | 100,000 | 9,000 | Excellent opportunities, especially for graduates of academic programs. |
| **Electronic computer operating personnel** | 175,000 | 20,400 | Although staff required to operate a computer installation may be reduced as new equipment is developed, total number of computer and auxiliary operators expected to increase very rapidly. |
| **Front office clerks (hotel)** | 50,000 | 3,200 | Moderate increase in employment as number of hotels, motels, and motor hotels increases. |
| **Library technicians** | 70,000 | 9,000 | Outlook excellent, particularly for graduates of academic programs. The continuous shortage of professional librarians contributes to very rapid growth. |
| **Mail carriers** | 246,000 | 12,200 | Rapid employment increase as populations spread into suburban areas. increasing use of motor vehicles will limit growth somewhat. |
| **Office machine operators** | 325,000 | 25,000 | Rapid increase despite automated recordkeeping systems, advances in interoffice communications, devices for transmitting data, and electronic computer technology, which permit centralized recordkeeping. |
| **Postal clerks** | 290,000 | 14,500 | Rapid employment growth resulting from increases in population and business. However, employment expected to grow more slowly than mail volume because of technological developments. |
| **Receptionists** | 240,000 | 30,000 | Despite rapid increase, young applicants will face keen competition from older and more experienced workers. Unlikely to be affected by automation because work is of a personal nature. |
| **Shipping and receiving clerks** | 370,000 | 12,400 | Employment will not increase as fast as the volume of goods distributed. Laborsaving equipment enables large firms to handle a greater volume of merchandise, using fewer clerks. |
| **Station agents (railroad)** | 10,900 | —225 | Decline in employment as railroads discontinue or consolidate passenger and freight services. However, trend may be slowed if rapid transit rail systems are developed on large scale. |
| **Stenographers and secretaries** | 2,650,000 | 237,000 | Very good opportunities. Increasing use of dictating, duplicating, and other office machines is not expected to affect growth greatly. |
| **Telegraphers, telephoners, and towermen (railroad)** | 13,200 | 100 | Declining employment resulting from mechanization of yard operations, new communications devices, and extension of centralized traffic control. |
| **Telephone operators** | 400,000 | 28,000 | Direct dialing and other automatic devices will offset employment impact of expanding business. Most growth will be in PBX installations where technological advances are minimal. |
| **Traffic agents and clerks (civil aviation)** | 37,500 | 2,600 | Rapid employment increase, mainly because of anticipated growth in air passenger and cargo traffic. Mechanization of reservation processing and recordkeeping will limit growth of clerical jobs. |
| **Typists** | 700,000 | 63,000 | Very good opportunities. Demand strongest for typists to do difficult work in senior jobs and for those combining typing and other office work. |

## SALES OCCUPATIONS

| | | | |
|---|---|---|---|
| **Insurance brokers and agents** | 410,000 | 16,200 | Field will remain keenly competitive despite expected increase in number of insurance policies issued. |
| **Manufacturers' salesmen** | 500,000 | 32,000 | Very good opportunities for well-trained workers, but employers will be selective. Demand strong for those trained to handle technical products. |
| **Real estate salesmen and brokers** | 225,000 | 14,200 | Many new positions will be created to serve growing population, but most openings will result from turnover. |
| **Retail trade salesworkers** | 2,800,000 | 150,000 | Many opportunities for full- and part-time work. Employment will increase more slowly than volume of sales. Most demand for workers who are well informed about their merchandise and skilled in salesmanship. |
| **Automobile parts countermen** | 65,000 | 2,500 | Continued employment growth related to increasing number of motor vehicles and a growing variety of replacement parts. |
| **Automobile salesmen** | 120,000 | 4,400 | Employment fluctuates, but tends to be more stable than car sales, which are affected by general business conditions, consumer preference, and availability of credit. Sales of new and used cars will increase as a result of increases in driving age population, multiple car ownership, and personal income. |
| **Automobile service advisors** | 10,000 | 300 | Complexity and larger number of cars expected to increase employment in this relatively small occupation. |
| **Securities salesmen** | 135,000 | 7,400 | Good opportunities. Many new and replacement openings for salesmen to serve growing number of individuals and institutions investing in securities. |

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| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| Wholesale trade salesworkers | 530,000 | 25,200 | Good opportunities. Demand will be stimulated by increase in business transacted and specialized services offered by wholesale houses. |
| **SERVICE OCCUPATIONS** | | | |
| Barbers | 210,000 | 12,800 | A growing population and the trend toward hair styling for men will create many new jobs. Shops having one or two barbers will probably remain most common. |
| Bellmen and bell captains (hotel) | 30,000 | 1,100 | Although many new hotels, motels and motor hotels will be built, employment expected to increase only slightly because of the type of construction and the emphasis on informality. Keen competition for the few bell captains' jobs that become available. |
| Building custodians | 1,100,000 | 80,000 | Very favorable opportunities despite improvements in cleaning maintenance technology which reduces the time needed to perform tasks. |
| Cooks and chefs | 670,000 | 48,000 | Excellent opportunities. Small establishments offer most opportunities for beginners. Acute shortage of skilled cooks and chefs. |
| Cosmetologists | 475,000 | 38,000 | Very good opportunities. Employment will rise because of increase in population and more frequent use of beauty salons. |
| FBI special agents | 6,600 | (3) | Employment expected to rise with growing FBI responsibilities. Turnover rate traditionally low. |
| Firefighters | 180,000 | 7,700 | Many new jobs created, as city fire departments enlarge staffs and as paid firefighters replace volunteers. |
| Licensed practical nurses | 320,000 | 48,000 | Opportunities will increase rapidly as these workers are utilized more commonly to fill demand for nursing services. |
| Hospital attendants | 800,000 | 100,000 | Very rapid rise in employment. Most openings will be in hospitals, but many will be in nursing and convalescent homes and other long-term care facilities. |
| Housekeepers and assistants (hotel) | 25,000 | 2,400 | Increase in employment related to growing number of hotels, large motor hotels, and luxury motels. Established hotels fill most openings by promoting assistant housekeepers and maids. |
| Police officers (municipal) | 285,000 | 15,000 | Very good opportunities although future jobs are likely to be affected by current changes in police methods and equipment. Specialists becoming more essential. |
| Private household workers | 1,700,000 | 121,000 | Large number of openings. Demand stimulated by rising family incomes and larger number of women working outside the home. |
| State police officers | 35,000 | 2,800 | Opportunities excellent. Number of applications restricted in some States by State Civil Service and other entry requirements. |
| Stewardesses (civil aviation) | 25,000 | (3) | Very rapid increase expected because of more air travel and high turnover; 30 percent of stewardesses leave jobs each year. |
| Waiters and waitresses | 960,000 | 67,000 | Employment will increase rapidly despite growth in use of vending machines. |
| **CRAFTSMEN** | | | |
| **BUILDING TRADES** | | | |
| Asbestos and insulating workers | 22,000 | 800 | Moderate employment increase as construction expands and industrial pipe is used more widely in manufacturing. |
| Bricklayers | 175,000 | 7,600 | Moderate employment increase, as construction expands and more structural and ornamental brick is used. |
| Carpenters | 869,000 | 39,300 | Moderate employment increase resulting from large rise in construction activity, but growth will be limited by technological developments. |
| Cement masons (cement and concrete finishers) | 60,000 | 3,600 | Rapid employment increase resulting from rapid expansion of construction and growing use of concrete and concrete products. |
| Electricians (construction) | 190,000 | 10,500 | Very rapid increase in employment expected in construction requiring electrical wiring for appliances, air-conditioning systems, electronic data processing equipment, and electrical control devices. |
| Elevator constructors | 14,500 | 500 | Slow employment increase. Some workers needed as industrial and commercial building activity expands and old structures are modernized. |
| Floor covering installers | 37,000 | 1,700 | Moderate employment increase resulting from expansion of construction activity and wider use of resilient floor coverings and wall-to-wall carpeting. |
| Glaziers | 9,000 | 500 | Very rapid increase in employment. Expansion of construction activity and the increasing use of glass in building construction will create very favorable long-range outlook. |
| Lathers | 30,000 | 1,250 | Moderate increase related to anticipated growth in construction and to new kinds of plaster that require lathing. |
| Operating engineers (construction machinery operators) | 285,000 | 16,200 | Very rapid employment growth resulting from increasing use of machinery for construction, particularly for highways. |
| Painters and paperhangers | 430,000 | 23,200 | Expected increase in construction points to moderate employment increase for painters. Painters also needed in maintenance and in use of such new materials as polyester and vinyl coatings and epoxys. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Painters and paperhangers—Con.** | | | Moderate employment increase for paperhangers because of wider use of fabric, plastic, and other wall coverings. Use of interior wall paint and wallpapers for "do-it-yourselfers" will limit growth. |
| **Plasterers** | 40,000 | 1,150 | Moderate increase resulting from growth in construction. New materials and methods have expanded use of plaster; but drywall construction will limit employment growth. |
| **Plumbers and pipefitters** | 330,000 | 19,500 | Rapid growth, as construction increases. Maintenance, repair, and modernization of existing plumbing and heating systems will create additional jobs. |
| **Roofers** | 55,000 | 3,000 | Rapid increase resulting mainly from construction growth. Technological innovations may limit growth somewhat. |
| **Sheet-metal workers** | 50,000 | 2,500 | Very rapid increase, due to expansion of construction that will use air-conditioning and refrigeration systems. |
| **Stonemasons, marble setters, tile setters, and terrazzo workers** | 30,000 | 850 | Little employment increase for stonemasons, due to decline of stonemasonry in modern architecture.<br>Little change for marble setters.<br>Moderate increase for tile setters, limited by increasing use of competing materials.<br>Rapid increase for terrazzo workers due to expanding use of terrazzo materials. |
| **Structural-, ornamental-, and reinforcing-iron workers; riggers; and machine movers** | 75,000 | 3,900 | Rapid increase, as a result of expected growth of construction and because metals are expected to become more competitive with other building materials. |
| **MACHINE OCCUPATIONS** | | | |
| **All-round machinists** [4] | 400,000 | 12,600 | Slow employment increase, with most openings resulting from need for replacements. |
| **Layout men** | (3) | (3) | Little or no change expected because of increasing use of numerically controlled machines. |
| **Instrument makers—mechanical** | (3) | (3) | Rapid increase, as result of growing use of instruments in manufacturing, research and development, and metalworking. |
| **Setup men (machine tools)** | 70,000 | 2,600 | Moderate increase, as a result of anticipated expansion of metalworking activities. Numerically controlled machine tools may change job duties. |
| **Tool and die makers** | 150,000 | 3,700 | Despite technological advances in toolmaking, employment is expected to increase slowly because of anticipated long-range expansion of metalworking industries. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **MECHANICS AND REPAIRERS** | | | |
| **Air-conditioning, refrigeration, and heating mechanics** | 100,000 | 5,000 | Continued fast growth of home air-conditioning will contribute to very rapid employment increase for air-conditioning mechanics. Oil burner mechanics may find openings limited, since relatively few new homes have oil heating systems. |
| **Aircraft mechanics** | 135,000 | 9,700 | Rapid increase due to substantial increase in the number of aircraft in operation. |
| **Appliance servicemen** | 205,000 | 8,600 | Rapid increase because of the larger number of household appliances. Increased efficiency of service will limit growth. |
| **Automobile body repairmen** | 100,000 | 3,550 | Moderate increase, primarily as a result of growing number of motor vehicle accidents. |
| **Automobile mechanics** | 615,000 | 20,000 | Moderate increase as a result of more automobiles and their new features such as air-conditioning, power steering, power brakes, and devices that reduce exhaust fumes. Greater shop efficiency will limit growth. |
| **Bowling-pin machine mechanics** | 6,500 | 50 | Little or no employment change. Despite growing popularity of bowling, improvements in manufacture of pinsetting machines result in fewer repairs. |
| **Business machine servicemen** | 115,000 | 8,500 | Outlook particularly favorable for those who have good mechanical ability and knowledge of electricity or electronics. |
| **Electric sign servicemen** | 6,100 | 300 | Rapid increase despite trend toward illuminated plastic signs. |
| **Farm equipment mechanics** | 40,000 | 1,100 | Slow increase due to declining number of farms and increased reliability of farm machinery. |
| **Industrial machinery repairmen** | 175,000 | 7,550 | Moderate increase as result of anticipated use of more machinery and equipment to fabricate, process, assemble, inspect, and handle industrial production materials. |
| **Instrument repairmen** | 85,000 | 4,600 | Very rapid increase because the use of instruments for scientific, industrial, and technical purposes will increase. |
| **Maintenance electricians** | 240,000 | 9,900 | Moderate increase because of growing volume of electrical and electronic equipment. |
| **Millwrights** | 75,000 | 2,400 | Slow increase, related to new plants, additions of new machinery, changes in plant layouts, and maintenance of increasing amounts of heavy equipment. |
| **Television and radio service technicians** | 125,000 | 3,000 | Moderate increase related to growing number of radios, television receivers, phonographs, and other home entertainment products. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980 [1] | Employment prospects [2] |
|---|---|---|---|
| **Truck mechanics and bus mechanics** | 110,000 | 2,900 | Moderate increase resulting from more freight transportation by truck. Favorable effect of increased intercity bus travel is expected to be offset by declining local bus transit. |
| **Vending machine mechanics** | 16,000 | 650 | Moderate increase of qualified mechanics, resulting from expansion of automatic merchandising. |
| **Watch repairmen** | 20,000 | 1,400 | Inadequate supply of skilled workers expected to continue. Well-trained workers in demand to produce miniaturized devices, especially in industries making scientific instruments and electronics. |
| **PRINTING (GRAPHIC ARTS) OCCUPATIONS** | | | |
| **Bookbinders and related workers** | 30,000 | 400 | Some employment decrease despite anticipated growth of bound printed material, because of increasing mechanization of bindery operations. |
| **Composing room occupations** | 190,000 | 3,200 | Slow decline caused by technological changes, despite greater volume of printing. Knowledge of electronic principles increasingly important for operation of new typesetting equipment. |
| **Electrotypers and stereotypers** | 8,000 | —25 | Moderate decline caused by technological change, despite increased printing volume. |
| **Lithographic occupations** | 73,000 | 1,800 | Slow increase despite expansion of offset printing. Technological developments expected to slow employment increase. |
| **Photoengravers** | 18,000 | 300 | No increase despite growing use of photographs and other illustrations and increasing use of color. Technological change in etching and engraving and greater use of offset printing will limit growth. |
| **Printing pressmen and assistants** | 90,000 | 2,850 | Moderate increase as volume of printing and use of color expands, requiring larger and more complex presses. Technological improvements will limit growth. |
| **TELEPHONE INDUSTRY OCCUPATIONS** | | | |
| **Central office craftsmen** | 80,000 | 2,700 | Moderate employment increase, resulting mainly from greater demand for telephone service and data communication systems. Electronic and automatic devices will restrict growth. |
| **Central office equipment installers** | 22,000 | 400 | No change in employment; however, increasingly complex central office equipment will require manpower having more and higher skills in electronics. |
| **Linemen and cable splicers** | 40,000 | 600 | Trends will differ among individual occupations. Very small growth is expected in number of cable splicers because of technological developments that increase worker efficiency. Employment of linemen not expected to increase significantly because of increased mechanization. |
| **Telephone and PBX installers and repairmen** | 86,000 | 3,000 | Moderate increase. Growing number of telephones and specialized equipment expected to cause some growth in volume of service. |
| **OTHER CRAFT OCCUPATIONS** | | | |
| **Automobile trimmers and installation men (automobile upholsterers)** | 8,000 | 350 | Moderate employment growth because of increased demand for custom-made automobile upholstery and other fabric products. |
| **Blacksmiths** | 15,000 | 500 | Slow decline because work formerly done by blacksmiths is increasingly done by other workers such as forge-shop craftsmen and welders, and because replacing small articles is cheaper than repairing them. |
| **Boilermaking occupations** | 25,000 | 1,000 | Moderate increase mainly because of expansion in industries that use boiler products, as well as increasing use of complex custom-made boilers. |
| **Dispensing opticians and optical mechanics** | 22,000 | 500 | Moderate increase in employment of dispensing opticians resulting from increased production of prescription lenses. However, little or no employment change for optical mechanics because of more efficient production methods and improved equipment. |
| **Foremen** | 1,444,000 | 56,200 | Moderate increase. But very rapid growth for construction foremen, and rapid growth in nonmanufacturing industries. |
| **Furniture upholsterers** | 32,000 | 800 | Shortage of trained workers expected to continue. |
| **Jewelers and jewelry repairmen** | 25,000 | 200 | Shortage of workers expected to continue. |
| **Locomotive engineers** | 35,000 | 1,350 | Slow decline in employment, due to continuation of decline in passenger business and increasing multiple-unit operation of diesel locomotives. |
| **Motion picture projectionists** | 16,000 | 750 | Slow increase because of expected slight increase in number of motion picture theaters. Competition for openings likely to continue. |
| **Shoe repairmen** | 30,000 | 1,500 | Shortage expected to continue. Growth limited by popularity of footwear that cannot be repaired easily or is very durable. |
| **Shop trades (railroad)** | 87,000 | 2,250 | Decline, despite the need for more rolling stock to handle the anticipated increase in freight traffic. |
| **Stationary engineers** | 260,000 | 7,050 | Slow increase, as improved equipment and better worker utilization limit the growth from continued use of large stationary boilers, refrigeration, and air-conditioning equipment in factories, powerplants, and other buildings. |

| Occupation | Estimated employment, 1968 | Average annual openings to 1980[1] | Employment prospects[2] |
|---|---|---|---|
| **OPERATIVES** | | | |
| **DRIVING OCCUPATIONS** | | | |
| **Busdrivers, intercity** | 24,000 | 900 | Moderate employment increase as a result of more intercity bus travel. Charter service, bus delivery of package express and first-class mail, and further curtailment of railroad service will increase intercity bus traffic. |
| **Busdrivers, local transit** | 65,000 | 500 | Little employment change expected as more people drive automobiles. |
| **Routemen** | 235,000 | 3,800 | Employment, which declined during the 1950's, will increase slowly as demand rises for suburban deliveries. |
| **Taxi drivers** | 85,000 | 1,200 | Although number of drivers is declining, high turnover results in need for many replacements. |
| **Truckdrivers local** | 1,200,000 | 37,000 | Moderate increase because of anticipated increase in volume of freight as total business activity rises. |
| **Truckdrivers, over-the-road** | 640,000 | 21,600 | Moderate rise. As commercial and industrial activity grows and industry continues to decentralize, intercity freight will increase. |
| **OTHER OPERATIVE OCCUPATIONS** | | | |
| **Assemblers** | 785,000 | 26,000 | Slow increase in employment as technological developments curb growth. Many replacements needed, however. |
| **Automobile painters** | 30,000 | 1,200 | Moderate increase resulting from larger number of motor vehicle accidents. |
| **Brakemen (railroad)** | 74,000 | 1,000 | Declining employment as railroad yards become more mechanized. Some replacement opportunities. |
| **Electroplaters** | 13,000 | 600 | Moderate increase, related to long-run expansion in metalworking and machinery industries and use of electroplating processes on more metals and plastics. Continuing mechanization and reassignment of duties to other workers will limit growth. |
| **Gasoline service station attendants** | 400,000 | 10,900 | Moderate increase resulting from growing consumption of gasoline and other service station products and services. |
| **Inspectors (manufacturing)** | 585,000 | 19,200 | Slow increase. Use of mechanized and automatic inspection equipment will offset rising need for inspectors. |
| **Machine tool operators** | 500,000 | 10,500 | Little change despite anticipated expansion of metalworking activities. Technological developments, including numerically controlled machine tools, will affect number and skills of machine tool operators. |
| **Meat cutters** | 200,000 | 4,500 | Little or no increase as technological developments increase worker productivity. Nevertheless, many replacement opportunities. |
| **Photographic laboratory occupations** | 30,000 | 1,600 | Moderate increase tied to growth of amateur, business, and government photography. However, greater use of improved mechanized film processing equipment will keep employment from growing as fast as volume of processing. |
| **Power truck operators** | 163,000 | 4,100 | Increase will be slow, as more efficient power trucks and other mechanized materials-handling equipment are developed. |
| **Production painters** | 160,000 | 4,000 | Employment to remain relatively stable as increasing use of mechanized and automatic equipment offsets rising demand for painting services. |
| **Signal department workers (railroad)** | 12,100 | —450 | Slow decline as improved signaling and communications systems require less maintenance and repairs. |
| **Stationary firemen (boiler)** | 73,000 | —600 | Employment expected to decrease moderately as result of more automatic, centralized equipment. |
| **Waste water treatment plant operators** | 23,500 | 2,500 | Rapid increase as result of construction of new treatment plants for industrial and domestic waste water. |
| **Welders and oxygen and arc cutters** | 480,000 | 23,000 | Rapid increase as a result of favorable long-run outlook for metalworking industries and wider use of welding. |
| **LABORERS (NONFARM)** | | | |
| **Bridge and building workers (railroad)** | 11,200 | 275 | Decline in employment expected to continue because of the increased use of power tools and other labor-saving equipment and of new materials that require less maintenance and repair. |
| **Track workers (railroad)** | 57,000 | 1,300 | Employment decline, as mechanized equipment and new materials reduce number of men employed in maintenance-of-way work. |
| **Construction laborers and hod carriers** | 750,000 | 29,000 | Some growth will result from increased construction, but use of mechanized equipment will limit opportunities. |

[1] Due to growth and death, retirement, and other separations from the labor force. Does not include transfers out of the occupation.

[2] The Bureau of Labor Statistics assessment of the 1980 occupational and industry outlook is based on a projected labor force of 100.7 million in 1980, Armed Forces of 2.7 million, and a resulting civilian labor force of 98 million. The employment outlook presented in the *Handbook* also assumes

a. maintenance of high levels of employment through the 1970's,
b. that no major event will alter economic growth substantially,
c. that economic and social patterns and relationships will change at about the same rate as in the recent past,
d. that scientific and technological advancement will continue at about the same rate as in recent years, and
e. that defense expenditures in 1980 will approximate the 1963 level which is somewhat higher than the levels before the Viet Nam buildup.

[3] Estimate not available.

[4] Includes layout men and instrument men.

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# A GUIDE FOR THE TRANSFER STUDENT

Conclusions and recommendations presented in this booklet are based upon the extensive research conducted as a part of the research study titled, "Development of Junior/Community College Curricula for Future Teachers of Industrial Education," USOE Sponsored Project No. 7-0074, Grant No. OEG-0-8-070074-3713 (085).

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PROJECT OFFICER/Elizabeth Simpson

SECRETARY/Judith Triemstra

# to the student . . .

The Industrial Education Department at Western Michigan University welcomes you as a prospective student. We know that, if you select industrial education as a career, you will find it a rewarding and interesting life. We will look forward to having you on our campus. You will find all staff members willing to give you any help you may need to reach your educational objective.

## what are you going to do for a living?

Right now, most of you are enrolled in a technology program and your original objective was to go into industry as a technician. But have you ever thought about becoming an industrial education teacher? What finer occupation could there be than preparing the youth of today for tomorrow. Today, there is a great need for thousands of additional industrial education teachers. If you are thinking about completing a degree at a senior institution, you should seriously consider becoming an industrial education teacher. The fact that you are already enrolled in a technology program indicates that you are already interested in the world of work. If you also like to work with young people, then you may want to become a teacher of students who badly need training so they will be able to earn a living.

## what is industrial education?

Industrial education today is a study of the industry and technology of our country dealing with such subjects as building construction, drafting, electronics, graphic communications, metallurgy, and power. Actually, the term industrial education includes instruction in industrial arts, technical, and vocational/industrial education. (See Figure One.)

INDUSTRIAL ARTS is a general study of industry and technology including its tools, materials, products, processes, and occupations.

TECHNICAL EDUCATION is concerned with programs to prepare technicians.

VOCATIONAL/INDUSTRIAL EDUCATION, or trade and industrial, is a branch of vocational education which is concerned with preparing people for initial employment or for upgrading or retraining workers in a wide range of trades and industrial occupations.

## how can i become an industrial education teacher?

You can become an industrial arts teacher with a four-year college degree and no work experience. Many industrial arts teachers do, however, gain work experience over a number of years and then become certified to teach in vocational programs. Others obtain their work experience before they attend college and enroll in a vocational/industrial teacher education program. Many of these programs also provide some opportunity to gain work experience while attending college.

To become a vocational/industrial teacher, you will need several years of work experience in the area in which you plan to teach and be certified as a vocational teacher. Each state indicates in its state plan for vocational education the exact amount of industrial experience needed. In Michigan, you must have two years of experience in the subject area in which you plan to teach. For example, if you want to become an automechanics teacher, the experience must be in this area. Work experience in a department store would not count.

To become a technical teacher in a community/junior college or senior institution, you will normally need at least a master's degree plus industrial work experience, as specified by the employing institution.

## what are the job opportunities?

It has been estimated that during the next five years there will be a need for another 100,000 industrial education teachers. The major job opportunities are as follows:

INDUSTRIAL ARTS IN THE JUNIOR HIGH OR MIDDLE SCHOOL – A typical teaching assignment includes courses in general industrial arts (some work in drawing, electricity, graphic arts, metal, power, and wood) or courses such as communications, construction, energy and power, general industry, and manufacturing.

INDUSTRIAL ARTS IN THE SENIOR HIGH SCHOOL – Typical teaching assignment includes specific courses in automechanics, building construction, drafting, electricity/electronics, graphic arts, metalworking, plastics, woodworking, and many others.

VOCATIONAL/INDUSTRIAL (T & I) AT THE UPPER SENIOR HIGH SCHOOL, AREA VOCATIONAL SCHOOL, OR VOCATIONAL DIVISION OF THE COMMUNITY/JUNIOR COLLEGE – Typical teaching assignment: teach courses in carpentry, machine shop, welding, etc., or related subjects in mathematics and science.

TECHNICAL EDUCATION IN TECHNICAL INSTITUTES AND COMMUNITY/JUNIOR COLLEGE – Courses taught in the area of specialty, such as drafting, electronics, fluid power, metallurgy, quality control, and others.

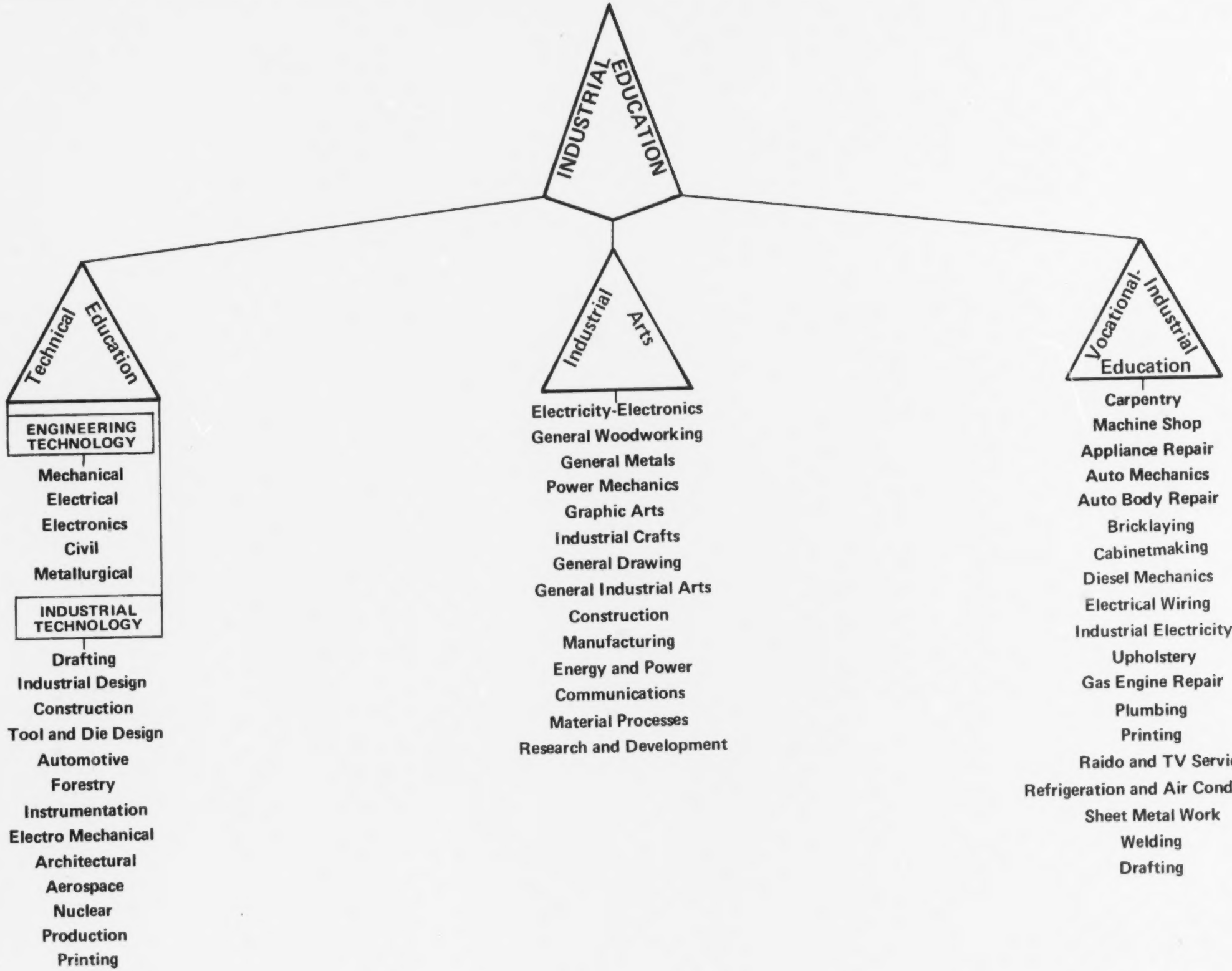
INDUSTRIAL EDUCATION
Technical Education
ENGINEERING TECHNOLOGY
Mechanical
Electrical
Electronics
Civil
Metallurgical
INDUSTRIAL TECHNOLOGY
Drafting
Industrial Design
Construction
Tool and Die Design
Automotive
Forestry
Instrumentation
Electro Mechanical
Architectural
Aerospace
Nuclear
Production
Printing
Industrial Arts
Electricity-Electronics
General Woodworking
General Metals
Power Mechanics
Graphic Arts
Industrial Crafts
General Drawing
General Industrial Arts
Construction
Manufacturing
Energy and Power
Communications
Material Processes
Research and Development
Vocational-Industrial Education
Carpentry
Machine Shop
Appliance Repair
Auto Mechanics
Auto Body Repair
Bricklaying
Cabinetmaking
Diesel Mechanics
Electrical Wiring
Industrial Electricity
Upholstery
Gas Engine Repair
Plumbing
Printing
Raido and TV Service
Refrigeration and Air Conditioning
Sheet Metal Work
Welding
Drafting

FIGURE ONE

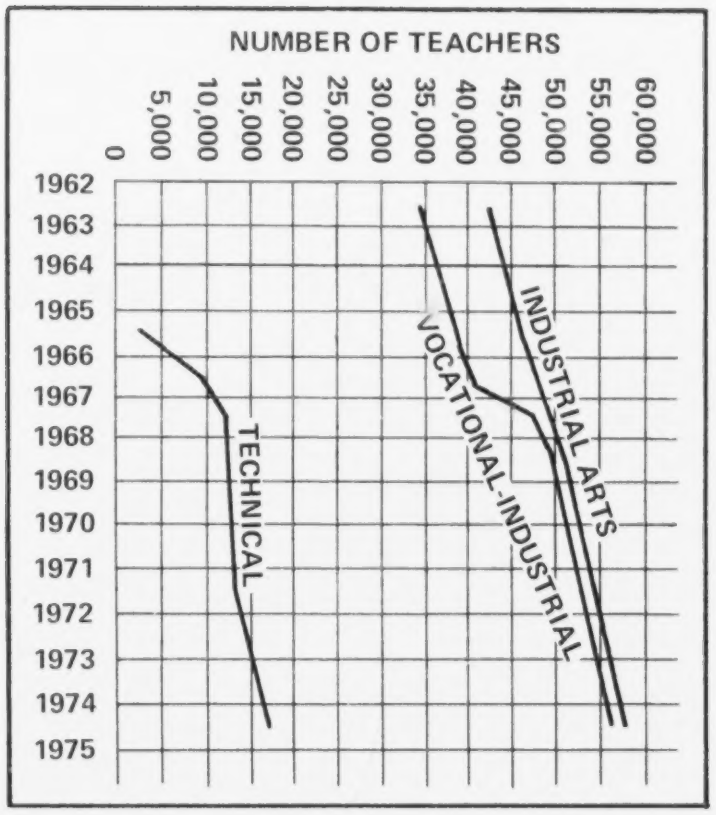


FIGURE TWO

**Total Number of Industrial Arts, Vocational/Industrial, and Technical Education Teachers (USOE)**

# what factors should i consider before deciding whether to become an industrial education teacher?

In considering an industrial teaching career, you should ask these questions of yourself:

WILL IT BE SOMETHING I ENJOY DOING?
If you like to work with ideas, machines, tools, and with people, then you will find industrial education teaching enjoyable.

HOW MUCH EDUCATION DO I NEED?
You will need to complete a B.S. degree in a senior institution. If you plan well, the first two years of your community/junior college work can be transferred without any loss of credit. If you plan to transfer, it is important that you see your counselor at the community/junior college during your freshman year and also the counselor at the senior institution as soon as possible. Teachers must also take additional work beyond the bachelor's degree to secure permanent certification. Most school salary schedules provide for increases with additional education and with specific increases when you obtain a master's, specialist's, or doctoral degree.

WHAT WILL BE MY FINANCIAL REWARDS?
Salaries for teachers have increased substantially in recent years and are comparable to those of professional positions in industry. Because the federal government is investing so many millions of dollars in manpower training and vocational education, there is every assurance that the demand for industrial education teachers will continue.

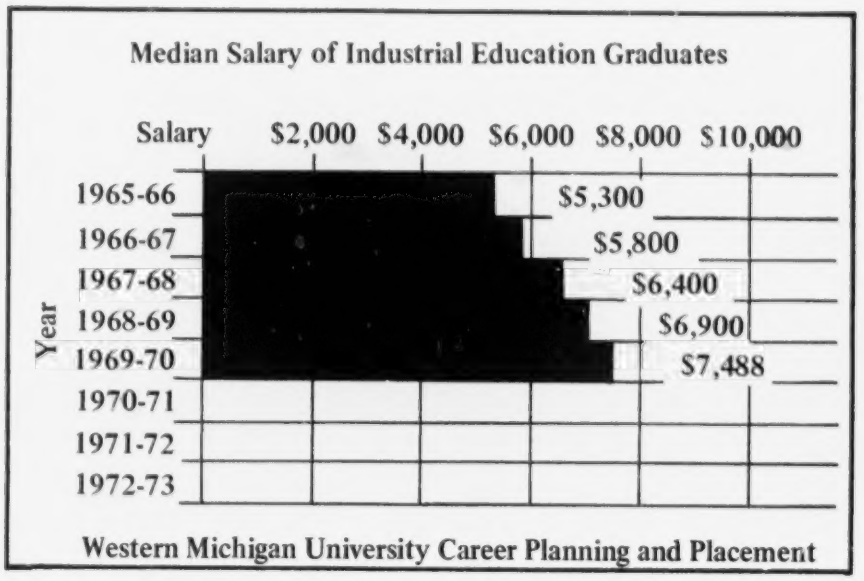


FIGURE THREE

IN WHICH AREA OF THE COUNTRY WOULD I LIKE TO LIVE?
One of the advantages of becoming an industrial education teacher is that there is an opportunity to move to almost any part of the United States to secure a job. Large cities, such as Chicago, Los Angeles, Miami, and New York continue to experience shortages of industrial education teachers. There are also many opportunities in small towns or rural areas. In fact, there are openings in every state and cities of all sizes. There is also a great need for teachers who are interested in working with the disadvantaged, particularly in the large inter-city systems.

WHAT WILL MY WORKING CONDITIONS BE LIKE?
An interesting facet of teaching industrial education is that you teach in informal, laboratory-type situations where you can work directly with your student in "hands-on" experiences with equipment, machines, and tools.

WILL A TEACHING CAREER PERMIT ME TIME FOR HOBBIES AND LEISURE ACTIVITIES?
Teaching offers you many opportunities to carry on with your own hobbies and interests. It also offers reasonable working hours and satisfactory vacations. The extended summer vacation period permits you to engage in travel and challenging summer work.

HOW CAN I PREPARE MYSELF FOR ADVANCED POSITIONS?

One of the keys to successful teaching is a willingness to continue your education after graduation from college. There are many opportunities to attend conferences, seminars, summer schools, and have other experiences that will improve your teaching competency and qualify you for better paying and more challenging positions. You will also want to complete advanced degrees.

WHERE CAN I ACQUIRE THE EDUCATION NECESSARY TO PREPARE ME AS A TEACHER?

There are approximately 230 colleges and universities in the United States that offer degrees in industrial education. Seven schools in Michigan offer undergraduate degrees. In making your choice, you should consider the answers to these questions:

Does the School Offer a Course of Study That Will Lead To Employment in My Field of Interest?

As an undergraduate student at WMU, you may major in any one of the following fields:

Drawing (Industrial Graphics)
Electricity/Electronics
General Industrial Arts
Graphic Arts
Metalworking
Power Mechanics-Automotive
Woodworking

An example of the undergraduate courses and curricula you can take, follows. Half of your technical work can be taken at the community/junior college before you transfer to WMU.

## undergraduate courses

Drawing (Industrial Graphics)

Survey of Drafting
Industrial Graphics
Technical Sketching
Advanced Industrial Graphics

Electricity/Electronics

Basic Electricity
Electronic Servicing Techniques
Laboratory Practices in Electricity/Electronics

General Industrial Arts

Industrial Crafts Techniques
General Plastics
Plastics Production Processing
Industrial Arts Design
Organizing and Administering the General Shop

Graphic Arts and Printing Management

Graphic Arts
Letterpress Presswork
Typographic Design
Science for the Graphic Arts
Machine Composition
Photolithographic Techniques
Lithographic Presswork
Printing Machine Maintenance
Advanced Presswork
Printing Processes
Estimating
Bindery Operations

Metal Work

General Metals
Machine Shop
Machine Tool Metalworking
Tooling and Production Metalworking
Metal Forming and Finishing
Patternmaking and Foundry
Hot Metalworking
Advanced Metalworking

Power Mechanics-Automotive

Power Mechanics
Applied Energy and Power
Auto Mechanics for Teachers

Woodworking

General Woodworking
Machine Woodwork
Wood Finishing
Upholstering and Woodturning
Residential Building Construction

Professional Courses in Industrial Education

American Industry
Course Planning and Construction
Teaching of Industrial Education
Plan and Organization of a School Shop
Independent Study in Industrial Education

# curricula . . .

The curriculum consists of laboratory and professional training designed for:

1. Industrial Arts Teaching
You will be prepared to teach industrial arts in the middle, junior, senior, or secondary school.

Curriculum requirement:
30-hr. General Industrial Arts Major or
Technical Area Major

20-hr. General Industrial Arts Minor or
Technical Area Minor

30 hrs. Teacher and Professional Industrial Education Courses

40 hrs. General Studies (Math 100, General Studies Elective)

4 hrs. Physical Education

124 hrs. (Minimum)

2. Vocational/Technical Education
You are prepared to teach vocational/industrial and/or technical courses in the secondary and post-secondary schools.

Curriculum requirement:
30-hr. Technical Major

20-hr. Technical Minor

28 hrs. Option I, (Vocational/Industrial Education leading to Secondary Teaching Certificate) Teacher and Professional Industrial Education Courses

OR

30 hrs. Option II, (Industrial Cooperative Education leading to Secondary Teaching Certificate) Teacher and Professional Vocational Education Courses

OR

30 hrs. Option III, (Technical Education without teaching certificate) Education, Supervision, and Electives

40 hrs. General Studies

8 hrs. Mathematics

4 hrs. Physical Education

130 hrs. (Minimum)

3. Industrial Education General Curriculum (non-teaching)
If you wish to secure a broad general industrial background, then you should choose this curriculum. The combination of courses you take will be decided in consultation with the counselor for this curriculum. (See the Industrial Arts Teaching Curriculum for General Studies and Physical Education Requirements.)

4. Printing Management
You will be prepared for upper supervisory or mid-management positions in the graphic arts industries.

Curriculum requirement:
33 hrs. Graphic Arts

18 hrs. Industrial Supervision

15 hrs. Business

40 hrs. General Studies

4 hrs. Mathematics (Algebra 100)

4 hrs. Physical Education

10 hrs. Electives to be selected from among the following areas: Art, Business Administration, Economics, Industrial Education, Industrial Engineering, Industrial Supervision, Language Studies, Mathematics, or Writing.

124 hrs. (Minimum)

5. Industrial Arts Therapy
You will be prepared to teach industrial arts in therapeutic and rehabilitation programs in public or private institutions. In this curriculum, it is necessary for you to have a general industrial arts major or minor and/or a technical major or minor.

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Does the college have a well-qualified teaching staff, adequate laboratory equipment, and other advantageous educational facilities?

There are 18 full-time staff members in Western's Industrial Education Department. Each is a specialist in a technical area. All hold advanced degrees with six having completed the doctorate.

Western has the finest physical plant in the Midwest and one of the two or three best in the United States. Included are laboratories for drafting, electricity/electronics, general industrial arts, graphic arts, metal technology, plastics, power mechanics/automotive, and wood technology. Built at a cost of more than $6 million, this air-conditioned building was opened in 1966.

Does the school have a reputation for producing teachers who are well trained?

Western produces approximately one-third of all the industrial education teachers in Michigan. Graduates of WMU are in constant demand. One evidence of the quality and reputation of this program is the fact that many of the deans of technical studies and their staff members obtained one or more of their degrees from Western Michigan University.

Does the college have a record of placing its graduates in education?

To date, there has always been a much greater demand for industrial education teachers than there has been supply. Most graduates have opportunities to select from several available jobs. All evidence indicates that this trend will continue for many years due to the increased emphasis on industrial/vocational and technical education in our schools at all levels.

What are the costs for tuition, fees, and other expenses?

The enrollment fees for an undergraduate student from Michigan are relatively modest. The present fee per credit hour for residents of Michigan is $ 18.00 plus additional laboratory fees in most courses. Dormitory room and board costs average $532 per semester.

Is there a guide to the kinds and numbers of courses I may transfer to WMU?

Each year the College of General Studies sends equivalency sheets to all the community/junior colleges in Michigan which show the courses from your college that can be transferred to WMU. For specific information, ask your counselor for this sheet.

The Industrial Education Department also sends equivalency sheets to each of the Michigan community/junior colleges. The equivalency sheets for your college are shown on the following two pages.

It should be noted that any courses listed from departments other than Industrial Education are of equivalent status only within the Industrial Education Department. Non-industrial education majors should consult with their respective departments.

An excessive number of hours transferred from the community/junior college can sometimes be applied toward elective credit.

## what are the other opportunities for industrial education graduates?

As long as technology continues to be so important in providing America with a high standard of living, the job opportunities for technically trained personnel will increase. Even though you may not want to enter teaching, there is a great demand for technically trained persons who have completed the bachelor's degree. Many former industrial education teachers serve as training directors, supervisors, and administrators in some of the largest industries in the United States.

| WESTERN MICHIGAN UNIVERSITY<br>Course | Sem. Hrs. | GRAND RAPIDS JUNIOR COLLEGE<br>Course | Sem. Hrs. |
|---|---|---|---|
| **Drawing (Industrial Graphics)** | | **NO EQUIVALENT AREA** | |
| IED120 Survey of Drafting | 3 | EG111 Introduction to Engineering Drawing | 3 |
| IED226 Industrial Graphics | 3 | TE105 Technical Drawing OR | 3 |
| | | EG120 Introduction to Engineering Drawing | 2 |
| IED227 Technical Sketching | 3 | | |
| ENGT231 Descriptive Geometry | 3 | TE130 Descriptive Geometry OR | 2 |
| | | EG121 Descriptive Geometry | 2 |
| IED326 Advanced Industrial Graphics | 3 | EG213 Advanced Engineering Drawing | 2 |
| ENGT330 Machine Drafting | 3 | | |
| ENGT331 Production Drafting | 4 | | |
| IED520 Architectural Graphics | 4 | AR204 Architectural Graphics | 3 |
| IED522 Laboratory Practices in Drafting | 2 | | |
| ELECTIVES (5-6 hours) | | | |
| ENGT430 Industrial Design | 3 | | |
| IED524 Commercial Architectural Design | 2 | | |
| IED525 Architectural Perspective and Rendering | 2 | AR203 Architectural Graphics | 3 |
| IED276 Industrial Arts Design | 2 | | |
| IED150 Graphic Arts | 3 | | |
| IED350 Photolithographic Techniques | 3 | | |
| IED130 General Metals | 3 | TE113 Industrial Processes | 3 |
| IED234 Machine Shop | 3 | TE119 Introductory Machine Operations | 4 |
| IED100 General Woodworking | 3 | | |
| IED306 Residential Building Construction | 4 | | |
| **Electricity/Electronics** | | **NO SPECIFIC AREA** | |
| IED160 Basic Electricity | 3 | TE106 Technical Electricity | 4 |
| | | TE107 Basic Electronics | 4 |
| ENGT240 Electrical Circuits | 3 | | |
| ENGT241 Electronic Circuits | 3 | TE204 Industrial Electronics | 3 |
| ENGT242 Electromagnetic Devices OR | 3 | TE201 Industrial Electricity | 3 |
| TRAN126 Automotive Carburetion and Electricity | 4 | | |
| IED360 Electronic Servicing Techniques | 3 | TE108 Subject to review of | |
| | | TE109 course descriptions | |
| IED460 Laboratory Practices in Electricity/Electronics | 3 | | |
| ELECTIVES (8-9 hours) | | | |
| IED120 Survey of Drafting OR | 3 | EG111 Introduction to Engineering Drawing | 3 |
| IED226 Industrial Graphics | 3 | TE105 Technical Drawing OR | 3 |
| | | EG120 Introduction to Engineering Drawing | 2 |
| ENGT340 Electronic Devices | 4 | TE205 Transistor Electronics | 3 |
| IED560 Electricity/Electronics for Teachers | 2 | | |
| IED174 General Plastics | 3 | TE220 Non-Metallic Fabrication | 3 |
| IED130 General Metals | 3 | TE113 Industrial Processes | 3 |
| IED180 Power Mechanics | 3 | | |
| IED582 Applied Fluid Power | 2 | TE217 Hydraulics | 3 |
| IED306 Residential Building Construction | 4 | | |
| **General Industrial Arts** | | **NO EQUIVALENT AREA** | |
| IED100 General Woodworking OR | 3 | | |
| IED200 Machine Woodwork | 3 | | |
| IED120 Survey of Drafting OR | 3 | EG111 Introduction to Engineering Drawing | 3 |
| IED226 Industrial Graphics | 3 | TE105 Technical Drawing OR | 3 |
| | | EG120 Introduction to Engineering Drawing | 2 |
| IED130 General Metals | 3 | TE113 Industrial Processes | 3 |
| IED150 Graphic Arts | 3 | | |
| IED160 Basic Electricity | 3 | TE106 Technical Electricity | 4 |
| | | TE107 Basic Electronics | 4 |
| IED170 Industrial Crafts Techniques | 3 | | |
| IED174 General Plastics | 3 | TE220 Non-Metallic Fabrication | 3 |
| IED180 Power Mechanics | 3 | | |
| IED276 Industrial Arts Design | 2 | | |
| IED575 General Industrial Arts Laboratory Organization | 2 | | |
| ELECTIVES(2-3 hours) | | | |
| IED573 Mechanics and Conditioning of Equipment or any advanced course within a technical area but no more than two courses may be elected within any one area. | 2 | | |
| **Graphic Arts and Printing Management** | | **NO EQUIVALENT COURSES** | |

| WESTERN MICHIGAN UNIVERSITY | | | GRAND RAPIDS JUNIOR COLLEGE | | |
|---|---|---|---|---|---|
| Course | | Sem. Hrs. | Course | | Sem. Hrs. |
| **Metal Work** | | | **NO EQUIVALENT AREA** | | |
| IED130 | General Metals | 3 | TE113 | Industrial Processes | 3 |
| IED234 | Machine Shop | 3 | TE119 | Introductory Machine Operations | 4 |
| IED235 | Machine Tool Metalworking | 3 | TE200 | Intermediate Machine Operations | 4 |
| IED332 | Tooling and Production Metalworking | 3 | | | |
| IED334 | Metal Forming and Finishing | 3 | | | |
| IED335 | Patternmaking and Foundry | 3 | | | |
| IED336 | Hot Metalworking | 3 | TE116 | Welding | 2 |
| IED338 | Advanced Metalworking | 3 | | | |
| IED174 | General Plastics | 3 | TE220 | Non-Metallic Fabrication | 3 |
| IED276 | Industrial Arts Design | 2 | | | |
| IED573 | Mechanics and Conditioning of Equipment | 2 | | | |
| ELECTIVES (0 hours) | | | | | |
| **Power Mechanics/Automotive** | | | **NO EQUIVALENT AREA** | | |
| IED180 | Power Mechanics | 3 | | | |
| IED280 | Applied Energy and Power | 3 | | | |
| TRAN121 | Automotive Chassis | 3 | | | |
| TRAN122 | Automatic Transmissions | 3 | | | |
| TRAN126 | Automotive Carburetion and Electricity | 4 | | | |
| TRAN226 | Automotive Engines | 4 | | | |
| IED384 | Auto Mechanics for Teachers | 3 | | | |
| IED582 | Applied Fluid Power | 2 | TE217 | Hydraulics | 3 |
| ELECTIVES | | | | | |
| IED160 | Basic Electricity | 3 | TE106 | Technical Electricity | 4 |
| | | | TE107 | Basic Electronics | 4 |
| IED560 | Electricity/Electronics for Teachers | 2 | | | |
| IED130 | General Metals | 3 | TE113 | Industrial Processes | 3 |
| TRAN222 | Fuels and Lubricants | 2 | | | |
| TRAN325 | Automotive Testing | 4 | | | |
| IED584 | Automotive Technology for Teachers | 3 | | | |
| IED585 | Advanced Automotive Technology for Teachers | 3 | | | |
| IED586 | Laboratory Practices in Auto Mechanics | 3 | | | |
| IED588 | Power Laboratory Techniques | 2 | | | |
| **Woodworking** | | | **NO EQUIVALENT COURSES** | | |

# how can i proceed with my transfer to wmu?

Western Michigan University welcomes qualified transfer students from community/junior college programs. Approximately 65 percent of the new students entering the Industrial Education Department of Western each year are transfer students from community/junior colleges.

Transfer students are eligible to participate in all college activities including athletics, to hold offices, and to be considered for financial aid opportunities on the same basis as other upperclassmen at WMU.

Students with a "C" average (2.0) or better in their community/junior college work should make application prior to the completion of their third semester at the community/junior college.

Applications for admission may be obtained from your community/junior college counseling office or by contacting:

Director of Admissions
Western Michigan University
Kalamazoo, Michigan 49001

# can i be counseled at wmu?

Members of the Admissions Staff and the Industrial Education Department at Western Michigan University stand ready to assist you in any possible way.

Counseling for admission purposes and for credit evaluation is available through the Admissions Office at WMU.

Industrial education counseling may be arranged at any time WMU is in regular session. Official counseling cannot be completed until you have been admitted and a transfer credit evaluation has been made. For counseling contact:

Ind. Arts Tchr. Educ.
Ind. Educ. General Curr.
Ind. Arts Therapy

→ Undergraduate Counselor
Industrial Education Department
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-0949

Printing Management

→ Undergraduate Counselor
Industrial Education Department
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-1900

Vocational/Tech. Educ.

→ Undergraduate Counselor
College of Applied Sciences
Western Michigan University
Kalamazoo, Michigan 49001
Ph (616) 383-1940

## is it possible for me to secure financial assistance at wmu?

Recognizing that the cost of attending a major university is of concern to many transfer students, Western Michigan University offers a variety of financial aid opportunities.

UNIVERSITY SCHOLARSHIPS – The scholarship program at WMU is designed to reward academic excellence and to alleviate financial need. Students may apply for scholarships ranging from $100 to $1000 a year.

Scholarship application forms and detailed information may be obtained by contacting:

Director of Scholarships
Western Michigan University
Kalamazoo, Michigan 49001

COMMUNITY/JUNIOR COLLEGE SCHOLARSHIPS – Western Michigan University offers a program to transfer students from Michigan community/junior colleges who have successfully completed two years of academic work. For detailed information, write to the:

Scholarship Office
Western Michigan University
Kalamazoo, Michigan 49001

INDUSTRIAL EDUCATION SCHOLARSHIPS – Several scholarships are available only to students enrolled in industrial education. For specific information, contact:

Industrial Education Department
College of Applied Sciences
Western Michigan University
Kalamazoo, Michigan 49001

GRANTS AND LOANS – Several sources of loans and grants are available at WMU including the National Defense Student Loan Program, the Michigan Higher Education Assistance Authority, Federal Student Loan Program, and United Student Aid Funds, Inc.

More detailed information may be obtained from a WMU undergraduate catalog, your community/junior college counselor, or by contacting:

Office of Student Financial Aid
Western Michigan University
Kalamazoo, Michigan 49001

EMPLOYMENT OPPORTUNITIES –
On Campus - Laboratory assistantships are available in the Industrial Education Department where students can work with selected instructors in the various industrial education areas. Application must be made directly to the Industrial Education Department.

The College Work/Study Program, a joint program between the University and the Federal Government, offers part-time employment in the University. Students in the low income group are given priority. A brochure describing this program is available from the Office of Student Financial Aid.

Part-time employment on campus is available in cafeterias, offices, switchboards, as staff assistants in dormitories, as custodians, etc. Direct application should be made to the particular area desired.

Off-Campus - Many part time job opportunities are available to students in and around the city of Kalamazoo. Students interested in part-time, off-campus work opportunities should apply at the Office of Student Financial Aid. They should not do so, however, prior to their approval for classes.

## will wmu assist me in securing a teaching position after graduation?

Free career planning and contacts for possible summer jobs are among the services provided by WMU's free Career Planning and Placement Office.

A graduating student is not assured employment, but he does have the chance to meet with possible employers from schools, businesses, and industries.